FIG. 117. *TAENIA INCOGNITA*

The strobila does not show any segmentation nor do any organs appear. Two tubes of the water vascular system can be plainly traced throughout. They are probably young specimens of an unknown worm.

*Taenia trachysauri*, sp. nov.

(Fig. 118)

Host—*Trachysaurus rugosus*, Stump-tailed Lizard.

Habitat—Intestines.

Locality—Australia—Zoological Park, New York.

On August 12, 1918, the host of this parasite came for examination. It is a strange looking reptile, being about 13 inches long  $\times$  2½ inches thick. Head triangular, 60 mm. long  $\times$  50 mm. wide; large mouth, full of teeth. Back is black and covered with very rough scales something like a pine cone; belly is black markings on a gray background. Tail only about one inch long, stubby, and thick, much resembling the head. Front legs appear to come out of sides of neck.

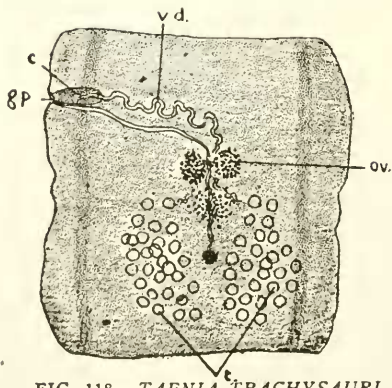


FIG. 118. *TAENIA TRACHYSAURI*

In the intestines there were numerous taenia, which afford the following description: A full sized worm is probably two inches long and quite pointed at the head, indeed, has quite a proboscis which is triangular in shape, and is .20 mm. long and as wide at the base. It is protrusible. Posterior to this portion of the head are four unarmed suckers which are relatively large. They stand out from the head, but cannot be said to be pedicelled. There is, behind the suckers, a neck which in turn is followed by a quadrangular shaped mass, before the strobila shows transverse markings dividing the segments. The genitalia begin to show in the short segments very near the head, and towards the end of the strobila their structure is very distinct, and the segments, which were, at first, very short now become somewhat longer than they are wide. The water vascular system is ample and continuous from the head throughout the strobila. The ovary is situated about the middle of the segment with the vitelline glands posteriorly, and still further toward the base are a number of large testes situated between the lines of the water vascular system. The vas deferens is long and coiling and enters a long oval cirrus sac, as the cirrus which in turn opens into the cloaca. This structure is situated near the anterior margin of the segment, being alternately on one side or the other. The vagina opens also in this cloaca or genital pore.

*Measurements of T. trachysauri*

|                                  |                 |
|----------------------------------|-----------------|
| Length .....                     | about 50.00 mm. |
| Width .....                      | 1.00 mm.        |
| Length of proboscis .....        | .20 mm.         |
| Width of proboscis at base ..... | .20 mm.         |
| Length of head .....             | .40 mm.         |
| Diameter of suckers .....        | .15 mm.         |

*Taenia quadribothria*, sp. nov.

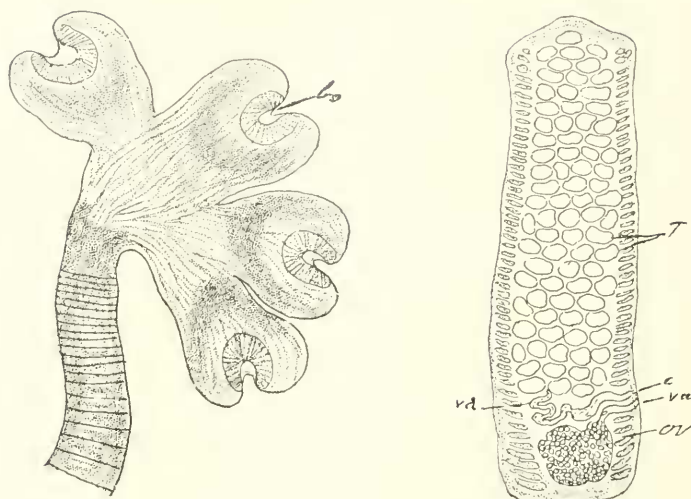
(Fig. 119)

Host—Sting Ray, *Dasybatus pastinacus*.

Habitat—Spiral valve.

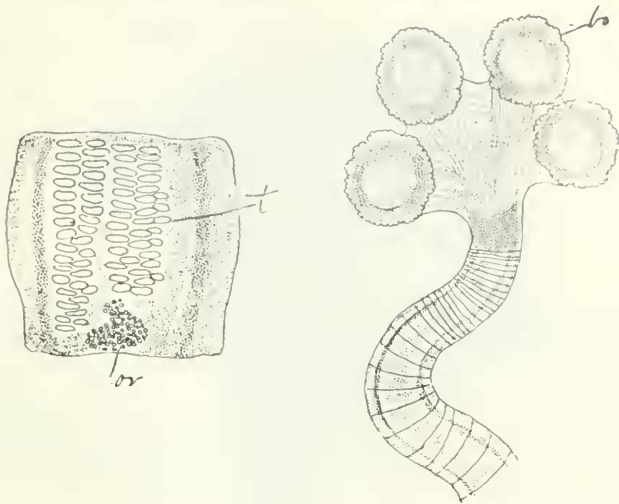
Locality—Wood's Hole, Massachusetts.

In the spiral valve of a Sting ray, *Dasybatus pastinacus*, there was found at Wood's Hole on July 8, 1916, a very small but remarkable *Taenia*. There were only 12.50 mm. of its length recovered, including the head and loose ripe proglottids. The head measures .1 mm. across

FIG. 119. *TAENIA QUADRIBOTHRIA*

the bothria, of which there are four, and it is these which constitute the peculiar anatomy of the worm. The head presents a fimbriated or digitate appearance, that is it is divided into four pedicelled suckers, which are each from .25 mm. to .30 mm. long and .30 mm. wide across the sucker portion. From the sucker to their attachment is a short neck or pedicel, which is narrower than the outer end, including about the cleft is the sucker proper, which latter does not extend entirely to the extreme margin of the cleft. They give the impression of being relatively powerful. The head formed by the junction of the pedicels terminates in a short neck unstriated for about .25 mm. or .30 mm. Then the strobila is transversely striated as usual in taenia, but not imbricated, and the segments rapidly become longer than at first where they are not more than .2 mm. or .3 mm. in length, at .130 mm. from the head they are .20 mm. long and a ripe segment, which has been thrown off, is .130 mm. long and .45 mm. wide, although they seem to vary much in size. The ovary appears very near the posterior end of the segment with the cirrus and vagina presenting on the left side at the margin slightly in advance of the anterior margin of the ovary, and a vitelline mass can be made out posterior to the ovary. The rest of the body of the proglottis is filled with oblong testes, placed in transverse rows. The vas deferens is a much coiled structure. Outside of the testes and just within the outer skin throughout the whole length on both sides is a mass of what appears to be vitellaria. Nothing is known of the life history of the worm.



FIG. 120. *TAENIA ROSAEFORMIS**Taenia rosaeformis*, sp. nov.

(Fig. 120)

Host—Sting Ray, *Dasybatus pastinacus*.

Habitat—Spiral valve.

Locality—Wood's Hole, Massachusetts.

From that wonderfully fertile region for taenioid parasites, the spiral valve of the sting ray, *Dasybatus pastinacus*, there was found on July 8, 1916, a small *Taenia* which probably has not heretofore been recorded. There were only 5 mm. found including head and strobila. The head is a flat disc composed of four circular bothria and their connective tissue. The two anterior ones being close together and the posterior ones wider apart, in fact they look something like four little roses or daisies. Their margins are corrugated and almost fimbriated, and the surface appears to be quite shallow. They are all connected by muscular striae or bands running in various directions. The head is .13 mm. in diameter and the suckers are each about .4 mm. in diameter. The neck without striations is short, not more than .2 mm. The striations at first are close together, but at the end of the 5 mm. of strobila the segments are .4 mm. long and about .4 mm. wide. The ovary in each segment is placed at the posterior end and the body of the segment is filled with two transverse rows of oblong testes, and outside of these along the sides is what appears to be a thick layer of vitellaria. The genital pore is unilateral, opening near the posterior end on the right side. The excretory canals run throughout from the head on both sides near the skin. The segments are not imbricated. No life history is known.

*Duthiersia elegans*, Perr. 1873b.

(Fig. 121)

Family—*Bothriocephalidae*, Cobb.

Subfamily—*Dibothriocephalinae*, Lühe.

Genus—*Duthiersia*, Perroncito 1873b.

Host—*Varanus salvator*.

Habitat—Stomach and intestines.

Locality—Buitenzorg, Java.

On May 27, 1916, Dr. W. G. MacCallum found in a monitor a number of these worms which should be recorded if only to note the distribution and host. The first was found by Perroncito in *V. niloticus* in Senegal and named by him *D. elegans*; since that time it has been found and described by several authors, and two other species named as *D. expansa* and *D. fimbriata*. However, now I believe it has been agreed that *D. fimbriata* should be the name and the others only synonyms.

It seems to be settled also that it is a form closely allied to *Solenophorus*. It has a more ornate head than any other member of the family. On close inspection the head will be found to be composed of two distinct suckers, the anterior edges of which are much fimbriated on their margins by numerous gracefully formed small suckers, and subsidiary to the two main suckers. There does not seem to be at the base of the main suckers any accessory sucker or opening such as is seen in some forms of *Solenophorus*, and here perhaps I may be allowed to express my opinion that the so-called accessory suckers at the base of the head in the above forms, are not "merely blind sacs," but are openings connected with the main suckers and functioned by the worm to enable it to release its hold of the firm attachment to the mucous membrane. In *D. fimbriata* the numerous small suckers on the margins of the main suckers can be partially relaxed and thus allow relaxation of the whole.

These worms exist in the stomach and intestines in various sizes and as they are easily broken, the strobila is generally found in pieces. The longest pieces found in two or three specimens of varanus were about 12 cm.  $\times$  5 mm. and 15 cm.  $\times$  5 mm. and 1.50 mm. thick. One about 10 cm.  $\times$  2 mm. wide was whole but young. Another whole one was 20 cm.  $\times$  3 mm. wide with ruffled posterior segments. The neck of the worm is free of segment marking for a short distance, and is gracefully narrow. This, however, is followed by a strobila which rapidly increases in width.

It is unnecessary to describe the genitalia, etc. for it is that of the *Bothriocephalidae*. However, a figure of a ripe proglottid is herein shown.

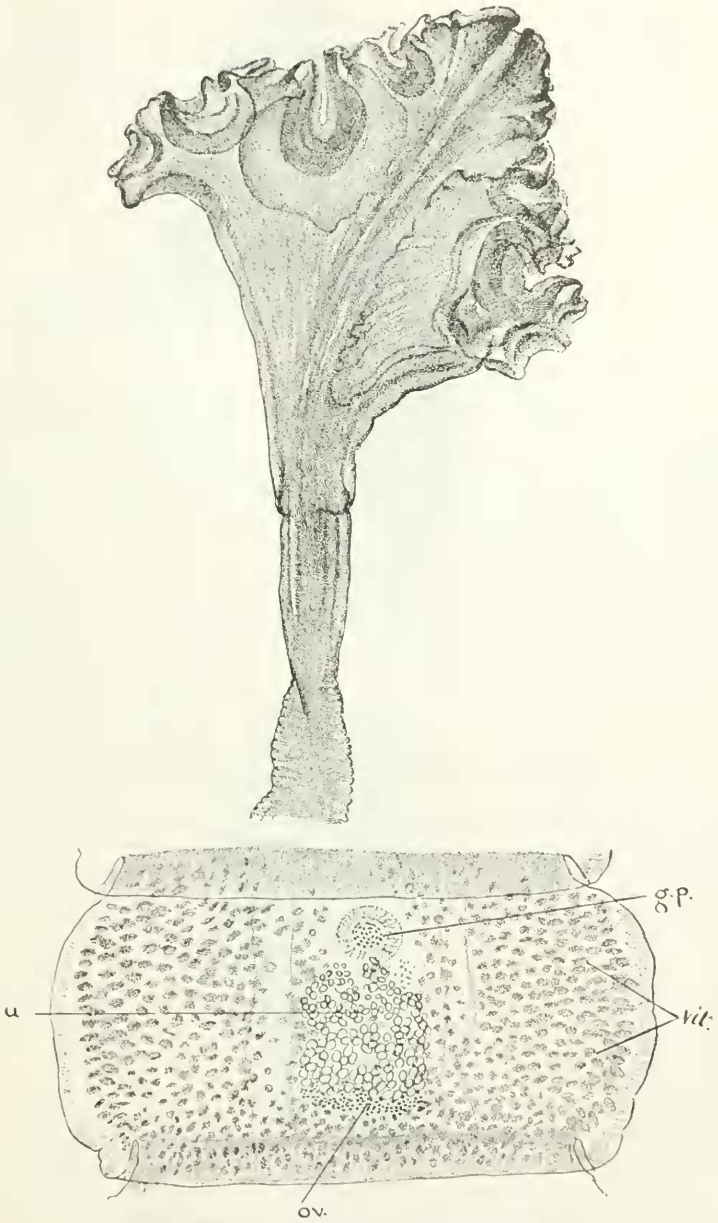


FIG. 121. DUTHIERSIA ELEGANS

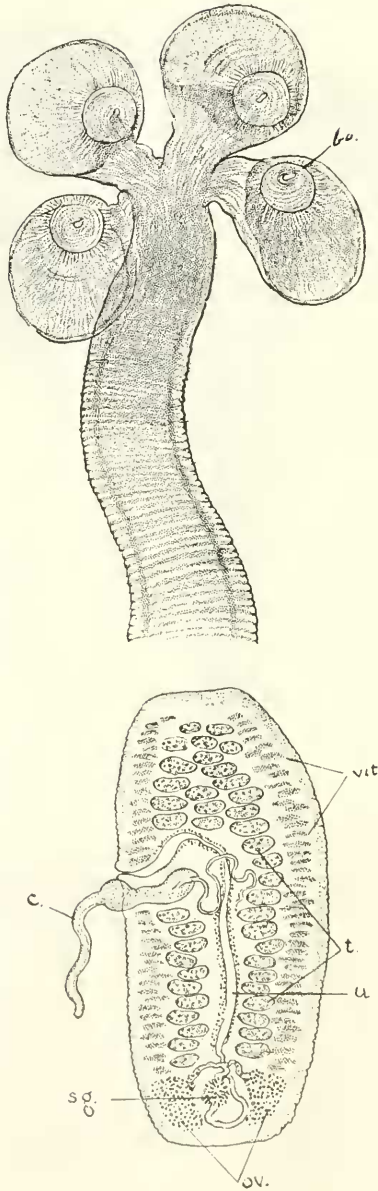


FIG. 122. *MONORYGMA GALEOCERDONIS*

*Measurements of D. elegans.*

|                       |           |
|-----------------------|-----------|
| Length .....          | 20.00 mm. |
| Width .....           | 3 × 5 mm. |
| Thick .....           | 1.50 mm.  |
| Head, varies in size. |           |

*Monorygma galeocerdonis*, sp. nov.

(Fig. 122)

Host—*Galeocерdo tigrinus*.

Habitat—Spiral valve.

Locality—Wood's Hole, Massachusetts.

This worm was found on August 14, 1915, in the spiral valve of a tiger shark, *Galeocерdo tigrinus*, and a number collected.

Diesing in 1863 first called attention to this form naming it *M. perfectum*, although Beneden claims to have found it in 1853 in *Laemargus borealis* at Ostende, and since it has been found in several other fish. There seem to be several species, at least five or six. Linton found one in a *Galeocерdo tigrinus* at Wood's Hole and also the same form in a *Carcharinus* at Gay Head, but he did not name the species. Consequently this one under consideration may be the same form, but of this I have no knowledge, and in order to give it a place I have given the species the above name. The one described shortly by Linton seems to have been a much smaller form, measuring in length only 3.77 mm., length of head 0.035 mm., diameter of neck 0.15 mm., and distance to first segment 1.6 mm., and ripe segment 0.65 mm. long × 0.17 mm. wide, a much smaller worm than this.

I have never seen any other species, but this is a remarkable form. Its head is represented by apparently four large suckers on long foot stalks and at the base of each of these is a smaller, very muscular sucker placed within the larger one. This is very peculiar, and yet the expansion at the end of each pedicel presents the appearance and structure of a sucker being deeply concave with a rim around its margin and muscular fibres, running towards the centre or rather towards the smaller sucker. Beside these there appears to be a certain amount of granular matter in the outer and larger portion of each sucker. These suckers on their stem flare out in different directions resembling a flower. They measure 0.360 mm. across and the small sucker measures 0.160 mm. across. The pedicel measures across near the head 0.120 mm. The neck is free of striations for the first 0.80 mm., although the margins are delicately notched, and the water vascular system is plainly shown. The striations, as usual, are at first very close together, but they gradually widen as the segments grow longer until the end where are the ripe segments, which measure in length from 0.80 mm. to 1.04 mm., and from 0.40 mm. to 0.48 mm. in width. The ripe segment is

a beautiful structure which stains unusually well, showing all of the organs plainly. The cirrus is usually exerted and is 0.40 mm. long with a circular bulb outside of the cloaca 0.080 mm. in diameter. As will be observed, Linton's worm is much smaller in every way, and thus could not be the same species. The length of *M. galeocerdonis* is 10 mm.  $\times$  0.480 mm. wide. Diameter of head 0.960 mm. The skin throughout is thick and delicately striated.

*Taenia acanthobothria*, sp. nov.

(Fig. 123)

Family—*Davaineidae*, Fuhrmann, 1907.

Host—*Actobatis narinari*.

Habitat—Spiral valve.

Locality—Batavia, Java.

These worms, of which there were several, were found in the spiral valve of an *Actobatis narinari* at Batavia, Java, on August 25, 1916, by Dr. W. G. MacCallum.

The head is cup-shaped and through the almost transparent tissue of the head may be seen a large rostellum which is evidently protrusible. Its margin can barely be seen to have any armature, although small marginal hooks can be easily seen even in specimens in which the rostellum is not protruded. The four suckers are each surrounded by a single row of small spines. The suckers are not relatively large and they are located near the anterior margin of the head. The neck is comparatively thick and striated very near the head. These striations gradually enlarge as the proglottids develop. The ripe proglottis is considerably wider than long and is rounded on its lateral margins. The genital pore appears on either side, near the anterior corner of the segment in the shape of a notch at which both cirrus and vagina are present. The cirrus sac is a fusiform sac. The uterus is filled with eggs and appears in the form of long sacs. The ovary is at the posterior margin and few or no testes are seen in these ripe proglottids.

*Measurements of Taenia acanthobothria.*

|                             |                      |
|-----------------------------|----------------------|
| Length .....                | 20.00 mm.            |
| Width .....                 | .60 mm.              |
| Suckers .....               | .096 mm.             |
| Across head .....           | .896 mm.             |
| Across neck .....           | .280 mm. to .400 mm. |
| Rostellum .....             | .560 mm.             |
| Depth of head.....          | .560 mm.             |
| Width of proglottis.....    | .320 mm.             |
| Eggs, round and yellow..... | .016 mm.             |



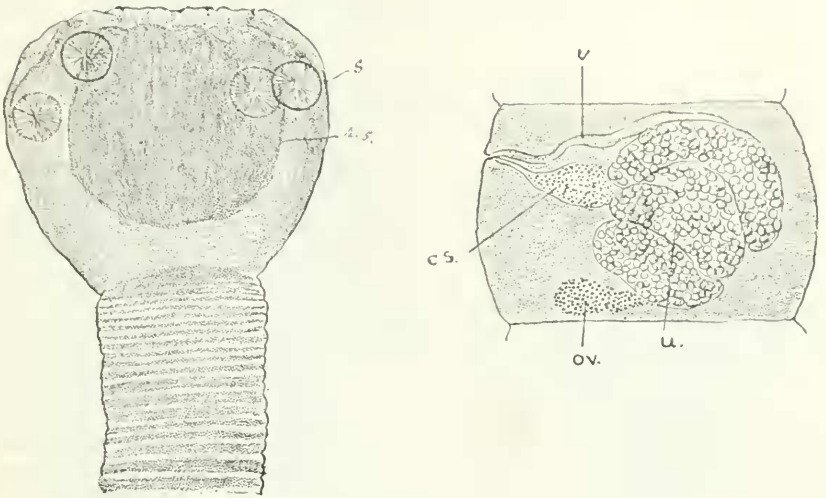


FIG. 123. *TAENIA ACANTHOBOTHRIA*

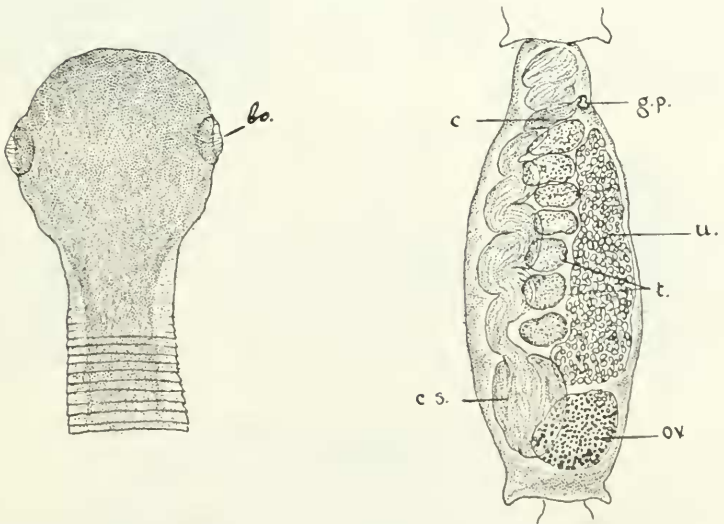


FIG. 124. *ANOPLOCEPHALA GLOBOCEPHALA*

*Anoplocephala globocéphala*, sp. nov.

(Fig. 124)

Host—A small ray.

Habitat—Spiral valve.

Locality—Singapore.

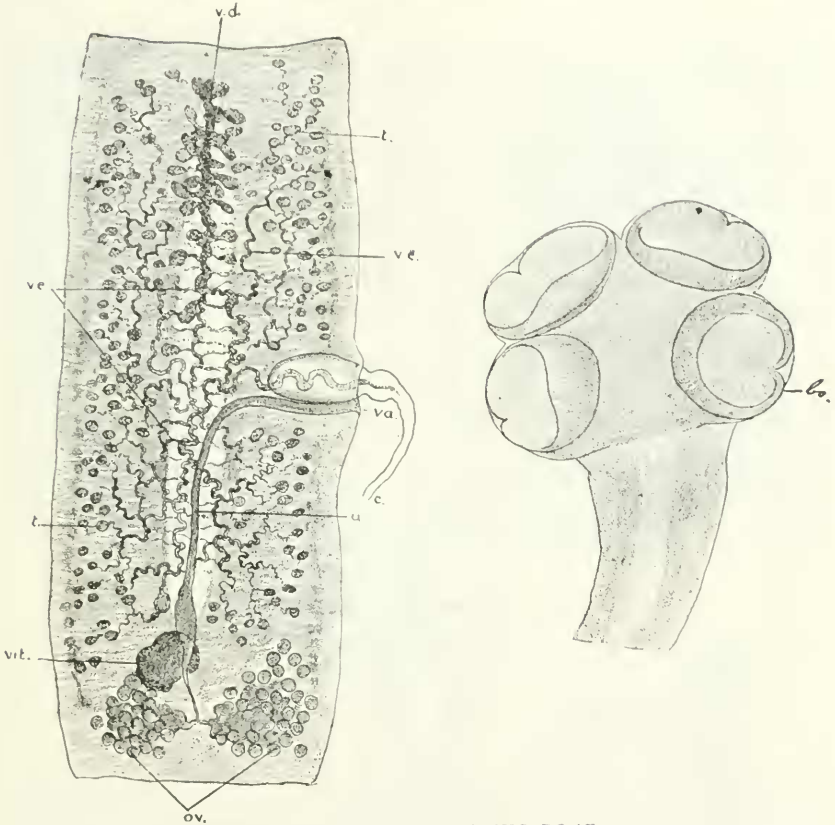
This small tapeworm was found in the spiral valve of a small ray, species not identified, at Singapore. On account of the almost globular head, it has been given the above name. When found, the head was buried in the mucous membrane of the intestine and was with difficulty withdrawn, and many others were broken in the attempt. It is very small, but presents many interesting characters. As will be observed (Fig., ) only two bothria are visible, but undoubtedly there must be two others on the opposite side. These bothria stand out prominently past the surface of the head. There is an opening at the extreme anterior margin of the head filled with a myzorhynchus, which is probably protrusible. The neck is about half the width of the head and presents transverse striae almost up to the head. The segments soon become longer and are decidedly imbricated. The ripe segments are peculiar, inasmuch as the ovary is situated at the extreme posterior end lying beside a large cirrus sac, which at once narrows into a coiling vas deferens which proceeds to a genital pore near the anterior end of the segment, where the anterior end of the segment is quite pointed, the posterior end being imbricated. Six or seven relatively large testes fill up the middle of the segment, and the rest of the space is filled with a uterine sac of eggs. The ripe proglottids appear like a string of fusiform shaped beads.

*Measurements of A. globocéphala.*

|                                |       |     |
|--------------------------------|-------|-----|
| Length .....                   | 25.00 | mm. |
| Width .....                    | .35   | mm. |
| Head .....                     | .45   | mm. |
| Length of ripe proglottis..... | 1.00  | mm. |
| Width of ripe proglottis.....  | .40   | mm. |
| Eggs .....                     | .016  | mm. |
| Ovary .....                    | .20   | mm. |
| Testes .....                   | .10   | mm. |

Family—*Tetrabothridae*, Fuhrmann, 1908.Subfamily—*Tetrabothrinae*, Fuhrmann, 1907.Genus—*Tetrabothrius*, Rudolphi, 1819a.

This genus was formerly described as only inhabiting mammals and birds in the adult form, but of late years it has also been found to be recorded for reptiles, and the following is a case in point. The diagnosis—It is a taenoid with the scolex unarmed. There are four suckers, each of which is incomplete on its outer margin, where there

FIG. 125. *TETRABOTHRIUS BOAE*

is a triangular notch. There is no rostellum, neck is well developed but no markings of segments are seen for a considerable distance, six or eight mm., then the proglottids outlined are very short but becoming much longer towards the end of the strobila. The bothria are large, prominent and cupshaped, almost as if set on pedicels. They are joined together by muscular striae at their bases. The whole head is unarmed.

*Tetrabothrius boae*, sp. nov.

(Fig. 125)

Host—Boa constrictor.

Habitat—Stomach and intestines.

Locality—Brazil; Zoological Park, New York.

In the stomach and upper part of the intestines there were found in the *Boa constrictor* from Brazil a large number of these worms.

Some of them were as much as twenty feet or more long. The opening of the uterus is in the anterior middle of the ripe segments. The ovary is large and the vitelline gland is situated in front of the ovary which is unusual. In this case, too, there seems to be on each side of the proglottid a row of vitellaria, but the main mass is in front of the ovary. A wide split or opening extends from the front of the ovary to the anterior end of the segment and in this the uterus and vas deferens make their way towards the genital cloaca. The rest of this middle opening is occupied with vasa deferentia which are in connection with the numerous large testes on either side. These all concentrate in the large vas deferens which enters the cirrus pouch or sac near the genital pore. This sac is oval and the cirrus may be seen through its transparent walls. The cirrus is a relatively large organ and is frequently seen protruded. It is quite enlarged near its base. Posterior to this and beginning at the cloaca is the vagina which is situated posterior to the cirrus sac. The genital pore is irregular and alternately unilateral. The vitelline gland in front of the ovary is circular and measures .400 mm. in diameter. Baird described a worm of this species from this host under the name of *T. gerradu* in 1860. This may be the same worm, but am not certain. See segment, Fig. 125.

*Measurements of T. boae*

|                     |                                      |
|---------------------|--------------------------------------|
| Length .....        | 20 to 30 feet                        |
| Width .....         | 2.60 mm.                             |
| Width of head ....  | 2.00 mm.                             |
| Length of head....  | 1.50 mm.                             |
| Diameter of bothria | .80 mm.                              |
| Ovary .....         | 1.040 mm.                            |
| Cirrus .....        | .96 mm.                              |
| Ripe segment .....  | 4.40 mm. long $\times$ 1.60 mm. wide |

*Dibothriorhynchus maccallumi*, sp. nov.

(Fig. 126)

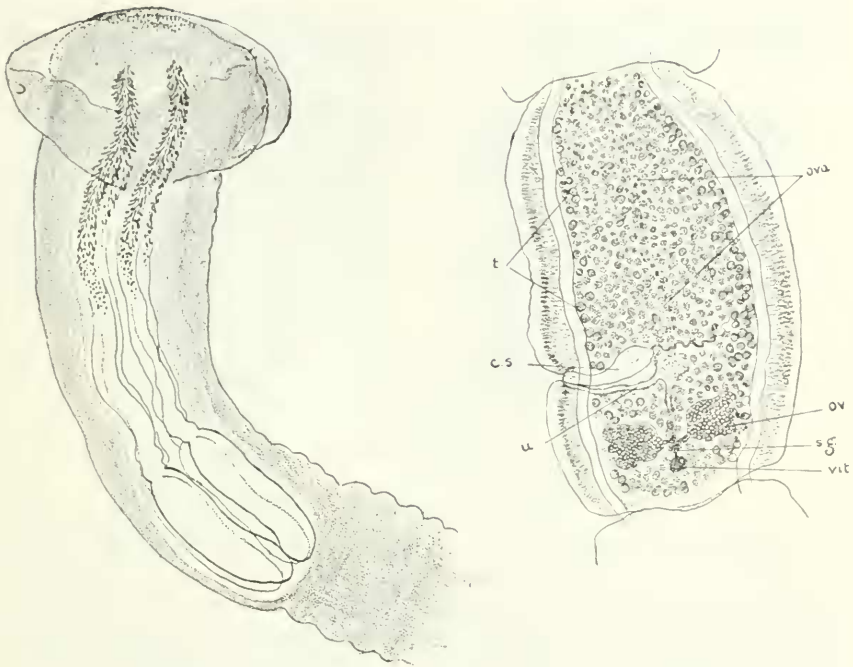
Host—*Sphryna tiburo*.

Habitat—Spiral valve.

Locality—Off Port Darwin, Australia.

On April 30, 1916, Dr. W. G. MacCallum, during an autopsy on a bonnet-head shark, found numbers of these worms in the spiral valve. There were also large numbers of ripe segments or proglottids in this location, which were quite large, being 7 mm. long  $\times$  2.40 mm. wide.

Linton, in his work at Beaufort, North Carolina, described a somewhat similar worm from this host, but apparently not the same. This mature worm had a head with two bothria, very delicately formed, with the anterior edges of the bothria carrying many small spines, and be-

FIG. 126. *DIBOTHRIORHYNCHUS MACCALLUMI*

side these on the lateral margins there was a much larger single hook, also on the lateral margin of each bothrium. In the figure given, the proboscidae are not shown protruded, but they can be plainly seen through the semitransparent tissue. The neck is thick and the muscular bulbs are short, as also are the containing tubes, which show the armed proboscidae as being short and thick. The tube measures .240 mm. near the outlet. The spines are large and recurve toward the apex as they lay in the tube to be reversed on extension.

The whole head is much wider than it is deep, and is joined by an unusually thick neck. The strobila shows striations immediately back of the bulbs, but they are not so deep as in that of some other of these forms. They are at first about 1.36 mm. wide and .192 mm. long. At about the middle of the segments are 1.44 mm.  $\times$  1.10 mm. long. The divisions here, too, are more deeply marked, but still the strobila is not imbricated. The segments are rather square with the genital organs near the posterior end. The ovary is divided into two parts with the shell gland behind and between the two halves. The genital pore appears on the left side one-third from the posterior end, and there the somewhat triangular shaped armed cirrus presents. The

body of the segment is filled with testes and ova. The vitellaria are on both sides of the segment near the margin and a wide water vascular canal is also on each side.

*Measurements of D. maccallumi.*

|                             |          |
|-----------------------------|----------|
| Length of mature worm.....  | 3 inches |
| Width of mature worm.....   | 1.00 mm. |
| Across head .....           | 1.70 mm. |
| Depth of head.....          | 1.00 mm. |
| Width of ripe segment.....  | 1.10 mm. |
| Length of ripe segment..... | 1.20 mm. |

*Tetrabothrius lachesidis*—sp. nov.

(Fig. 127)

Host—Fer de Lance, *Lachesis lanceolatus*.

Habitat—Intestines.

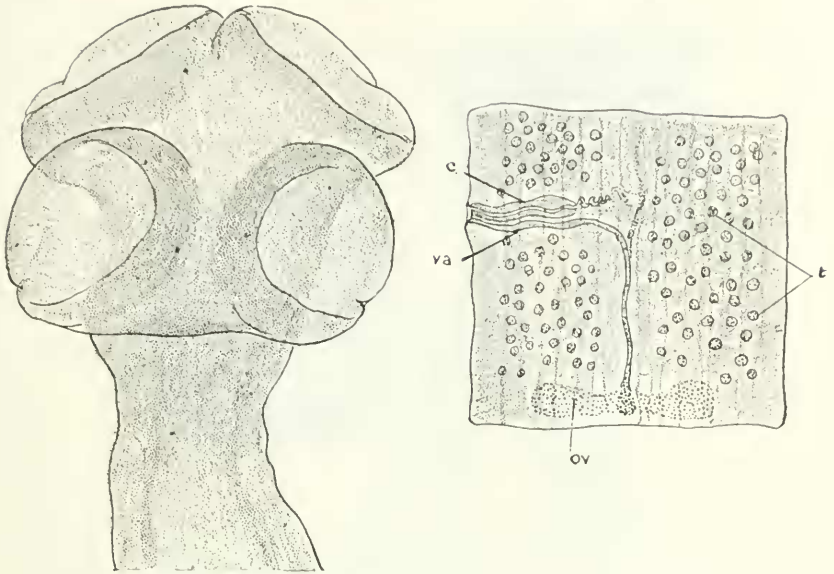
Locality—Island of Trinidad, South America.

The type specimen of this worm was found in a *Boa constrictor*, Brazil, March 12, 1919, a large snake seven feet, six inches long.

This form was taken from the intestine of its host and it corresponds with the type, although much smaller. The head has four deep suckers which are unarmed, no rostellum. The suckers have each a notch on one side, and the substance of the head is seen to be striated with muscular fibres in all directions. The head is unarmed. The neck is free of striations for the first 1.120 mm. The strobila recovered was not more than about 75 mm. in length, and no ripe proglottids were seen. These, when seen, are open longitudinally to contain the gravid uterus, hence Rudolphi described it as a subgenus of *Bothriocephalus*.

The ovary is relatively large and the uterus extends from the ovary almost to the anterior end of the proglottis. The genital pore is situated irregularly alternately about the middle of the lateral margin of the segment, and the vagina curves toward the centre to join the uterus. The testes are numerous and large, and the cirrus sac containing the cirrus is large and opens anteriorly to the vagina in a common cloaca. There does not appear any vitelline gland anterior to the ovary in this instance, but only a portion of the strobila is seen—no ripe proglottids. In the proglottids of *T. boae* in *Boa imperator*, another host, the vagina is seen to be anterior to the cirrus in the cloaca. Otherwise the worms are like that above described. In ripe segment the ovary is at the posterior margin, uterus starting at the shell gland in the middle and proceeds to the right side of segment near the anterior quarter, cirrus anterior to the uterus. Rest of square segment filled with testes and vitellaria.



FIG. 127. *TETRABOTHRUS LACESIDIS**Measurements of T. lacesidis*

|                             |           |
|-----------------------------|-----------|
| Length .....                | unknown   |
| Width .....                 | 1.20 mm.  |
| Diameter of head.....       | .960 mm.  |
| Diameter of bothria.....    | .560 mm.  |
| Width of ovary.....         | .720 mm.  |
| Length of proglottids ..... | 1.44 mm.  |
| Width of proglottids.....   | 1.120 mm. |

*Tetrabothrius brevis*, sp. nov.

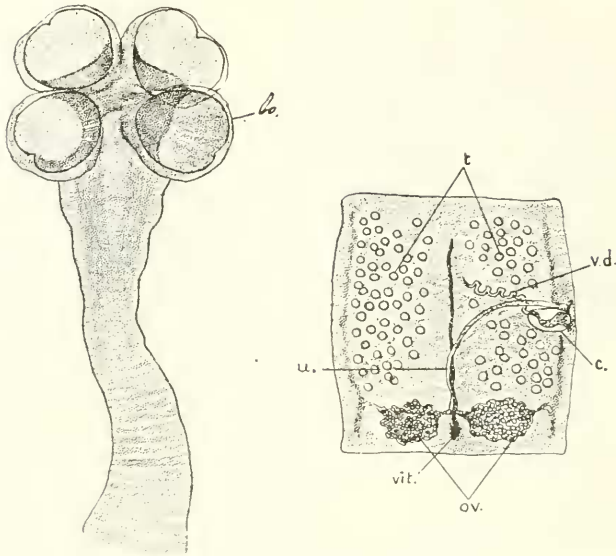
(Fig. 128)

Host—*Boa imperator*.

Habitat—Stomach and intestines.

Locality—Mexico.

During the examination of this snake which was 60 inches long and  $2\frac{1}{2}$  inches in diameter, a lot of worms were found in the first part of the intestine, and one large one was found alone in the stomach. They were quite lively and coiled and tangled themselves very much. These are about 10 to 15 inches long, possibly longer, for some of those with the widest strobila were evidently broken, in fact few could

FIG. 128. *TETRABOTHRIUS BREVIS*

be found which one could be sure were entire. As will be seen, they are quite a different species from those found in *B. constrictor* from South America. The anatomy of the ripe proglottids is quite different as will be seen by a comparison of them. They are both *Tetrabothridae*, but of different species, which may be found throughout Mexico and Central America. These worms found have a head almost exactly similar to that of *T. boae*, the same raised cup-shaped suckers with the usual triangular notch in the external margin. They are quite unarmed, but from their muscular structure and that of the head proper, they give the impression of great power. The neck rapidly narrows from the head and shows ample water vascular tubes. The transverse markings on the strobila are, at first, very close together, but towards the posterior end of the strobila, the ripe proglottids are even longer than wide. Their structure showing the genital apparatus is as follows. Near the posterior end, the two large lobes of the ovary are distinctly seen joined together, and from the centre of this junction arises the uterus which extends almost to the anterior end although receiving the vagina about its middle. The vagina curves to one or other lateral margin at about its middle, but crossing the vas deferens, opens in front of the cirrus at the cloaca. The cirrus, after passing through an oval shaped cirrus sac near the cloaca, appears behind the vagina, and its outlet is surrounded by a mass of short hair like structures.

On each side of the uterus the segment is filled with testes and some eggs. The vas deferens is a much coiled structure, connected with the testes and terminating in the cirrus sac, but the whole anatomy

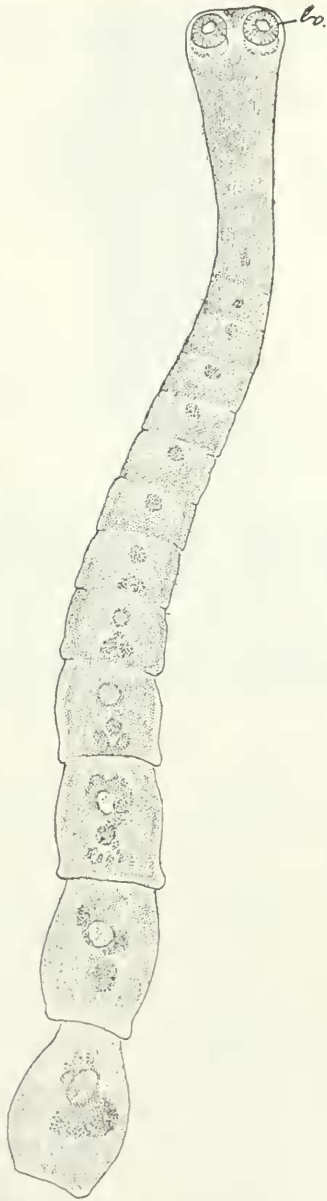


FIG. 129. *MESOCESTOIDES BASSARISCI*

of the ripe segment is entirely different from that of *T. boac*, as may be seen by a reference to the plate of that worm. Neither worm has any rostellum. The developed segment is somewhat longer than wide.

*Measurements of T. brevis.*

|                            |                    |
|----------------------------|--------------------|
| Length .....               | about to 15 inches |
| Width of widest segments.. | 2.00 mm.           |
| Width of head.....         | 2.00 mm.           |
| Width of sack sucker.....  | .80 mm.            |

*Mesocestoides bassarisci*, sp. nov.

(Fig. 129)

Family—*Mesocestoididae*, Fuhrmann, 1907.

Subfamily—*Mesocestoidinae*, Lühe, 1894a.

Host—*Bassaricus astuta*, Rhoads, 1894.

Habitat—Intestines.

Locality—Zoological Park, from Mexico.

These worms were found on April 1, 1919, in the first part of the small intestine, posterior to the stomach. There were great numbers of them. They are very small and present some peculiarities in their morphology. Although much smaller than the type species, *Mesocestoides ambiguus*, Vaillant, 1863, yet in most other characters it would seem to belong to this family.

The head and neck present a triangular form. The head itself has no rostellum, in fact distally between the suckers it is flat or depressed. It is entirely unarmed as are also the suckers which are circular. The suckers are relatively large. The neck is smooth and devoid of striations for about one-quarter of the length of the worm. The segments then begin to be formed and from the first there is seen in each a dark spot showing the location of the genitalia. The ripe segments are not sharply marked off from each other, the lateral outline of the strobila only showing a slight depression between each pair. The genital pore is median and situated well towards the anterior margin of the proglottis, and the uterine tube extends back between the two lateral masses of the ovary and behind those is to be seen the vitellaria. The testes are comparatively large and not numerous. All the genitalia are included between the longitudinal excretory canals. The host is a small coyote with a ringed black and white bushy tail. It is found in Mexico and southern North America.

*Measurements of M. bassarisci.*

|                   |                     |
|-------------------|---------------------|
| Length .....      | 4.00 mm.            |
| Width .....       | .70 mm.             |
| Across head ..... | .320 mm.            |
| Suckers .....     | .120 mm.            |
| Eggs .....        | .040 mm. × .024 mm. |

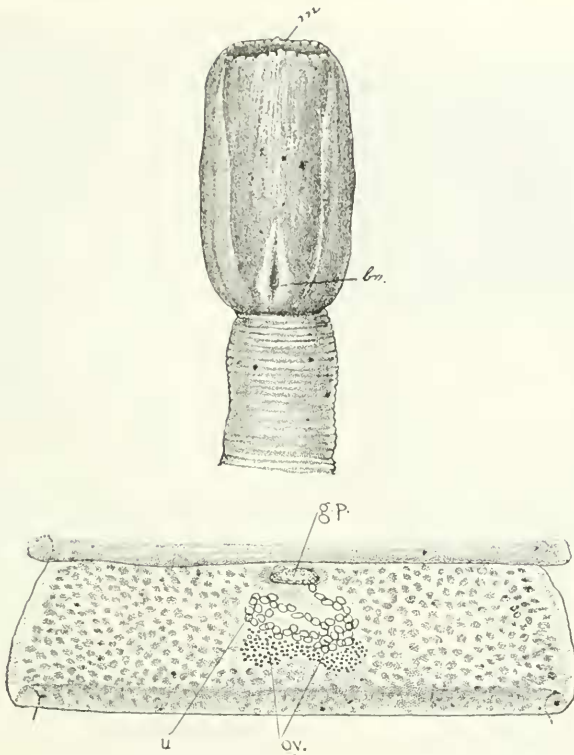


FIG. 130. SCYPHOCEPHALUS BISULCATUS

*Scyphocephalus bisulcatus*, Riggenbach, 1898b. \*  
(Fig. 130)

Family—*Bothriocephalidae*, Cobbold.

Subfamily—*Scyphocephalinae*, Ariola, 1899d.

Host—*Varanus salvator*.

Habitat—Intestine.

Locality—Buitenzorg, Java.

On May 27, 1916, Dr. W. G. MacCallum, while autopsying a monitor, came across two of these worms in the reptile's intestine. One was loose while the other had a firm hold on the wall of the intestine. It was so firmly attached that a piece of the intestine had to be cut about the mouth, and even then it was impossible to separate the sucker from its hold without tearing it. In many ways this worm seems closely related to *Duthiersia* and *Solenophorus*. It is found in the same host, in the same habitat, their only chief difference being the

\*Vorläufige, Mittheilunge, Zool. An. 2, Leipz. 2. (572) V. 21, Vol. 7, pp. 465-566.

anatomy of the head, for the strobila is similar. The head is different, for instead of consisting of two pipe-shaped suckers as in the *Solenophorus* and the very ornate head of the *Duthiersia*, which also is divided into two main suckers more or less triangular in shape, this worm has only one single goblet shaped sucker which is exceedingly muscular and powerful. It has also two sulci somewhat like those of the other members of the family. These are situated on opposite sides of the base of the head and are comparatively short. They are deep at the posterior end, but become shallow as they extend anteriorly. Thus, it will be seen, that the worm really belongs to the order *Tribothria*. Ariola 1899 and Lücke 1899 p. 542, and Braun 1900 a p. 1676, 1682. The head is whiter in color than the rest of the worm, and the whole anterior end is an open sucker mouth and its margin is divided into closely set teeth-like processes or coarse serrations apparently only of the mucous membrane. The walls of the head are thick and striated or thrown into very narrow folds, which may only be muscular striations. The cavity of the sucker occupies almost the whole head and terminates just posterior to a slit-like opening which looks like a long genital pore, which however, is the sulcus appearing on either side. In *Scyphocephalus*, the strobila does not begin with the neck, but the striations are to be seen at once after the head. It soon widens, but does not become very wide. It is thick and the segments are narrow even when ripe. The ovary is quite distinct and the uterus has only a few coils from which the yellow oval eggs are given off at the more or less circular pore near the middle of the anterior margin of the segment as is usual in the *Bothriocephalidae*. The vitellaria are plentiful but the testes are not abundant.

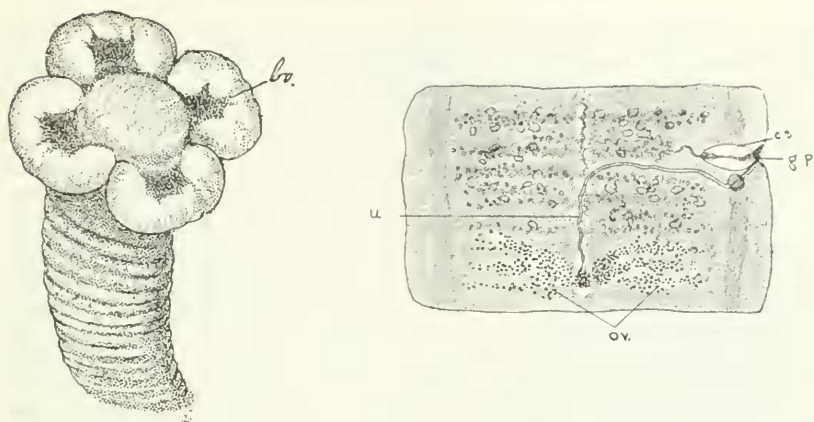
*Measurements of S. bisulcatus*

Length—This cannot be given as only three or four pieces were found, less than six inches in all.

|                              |                             |
|------------------------------|-----------------------------|
| Width .....                  | 4.00 mm. and 1.00 mm. thick |
| Head, length .....           | 3.40 mm.                    |
| Head, width .....            | 2.40 mm.—6.00 mm.           |
| Length of sulci.....         | 2.20 mm.                    |
| Width of each sulcus.....    | 1.00 mm.                    |
| Length of ripe proglottids.. | .80 mm.—1.00 mm.            |
| Width of ripe proglottids..  | 6.00 mm.                    |

Riggenbach, who first described this worm, claims that it is a new genus and new species, for while it has the strobila of the *Bothriocephalidae*, it cannot on account of the character of its head be classed in that family, whose chief characteristic is the fact that the head has only two sulci or bothria, while *Scyphocephalus* has three bothria, a central main bothria and two lateral ones. He is of the opinion that the central main sucker must have been formed secondarily and that the lateral sulci or suckers are in a state of partial retrogression



FIG. 131. *TAENIA PATINI*

and that from lack of use may disappear finally. In every other respect than in the matter of suckers the worm follows the morphology of the *Bothriocephalidae*. I have, therefore, tentatively at least, left it in the family *Bothriocephalidae*.

*Taenia patini*, sp. nov.

(Fig. 131)

Host—Ikan patin.

Habitat—Intestine.

Locality—Bandjermassin, Borneo.

This interesting cestode was collected at Bandjermassin, Borneo, by Dr. W. G. MacCallum from a large siluroid fish, locally known by the name Ikan patin. The host was taken in the river at that point and appeared to be of the catfish family, and was decorated with four fairly long barbels. The only parasites found were a number of the above taenia and some strongyles, all found in the intestine. It is claimed as a new genus on account of the peculiar structure of the head.

The *Taenia* is a worm about twenty inches in length, and is but little narrower at the neck than at the widest portion of the strobila, and it is thick and fleshy. The head is of peculiar formation. It enlarges suddenly from the neck and is fluted into four main masses and these again are superficially divided by lines which run to the anterior margin. The extreme anterior aspect is somewhat hollowed out and divided into four bothria with large thick marginal lips which are somewhat puckered about their central opening. In the centre is a round, prominent myzorhynchus, which may be protrusible, but which in quietude is below the level of the marginal lips of the bothriae, and

seems to be of a different structure and color from the rest of the head, being yellow and dense. On looking at the head as pressed and mounted on a slide, it appears to be a double row of finger-like processes, longest on the outer margins, all pointing anteriorly and relatively deep among them are the four bothriæ. The neck is thick and is crossed from side to side by irregular transverse divisions. These divisions or segments are narrow throughout the strobila with irregular margins, but as the segments get more fully developed the margins are not so irregular and the genital cloaca is seen to be near the junction of the anterior one-quarter with the posterior three-quarters. This is seen alternately on one side or the other. The cirrus sac is a long oval, and the cirrus presents anterior to the vagina at the cloaca. From the posterior end of the same is seen the much coiled vas deferens coming from different parts of the segment after communicating with the testes. The vagina has a funnel shaped inlet, and at a short distance from its entrance may be seen a more or less rounded muscular constrictor. This is very conspicuous and quite unusual. It is more than twice the diameter of the vagina.

The ovary is very near the middle of the posterior margin, and while it is composed of two masses, it is divided by a narrow portion, where apparently the uterus begins, and this, after coiling through the shell gland situated near the posterior margin of the segment, makes its way anteriorly through the centre of the segment, receiving the vagina shortly after its origin. The testes are large and numerous. Vitellaria, marginal.

*Measurements of Taenia patini.*

|                           |                           |
|---------------------------|---------------------------|
| Length .....              | 20 inches                 |
| Width .....               | 3.00 to 4.00 mm.          |
| Width of neck.....        | 1.50 mm.                  |
| Width of head.....        | 2.00 mm.                  |
| Width of ripe proglottids | 3.00 mm.                  |
| Eggs .....                | .120 mm $\times$ .040 mm. |

*Rhynchobothrius carangis*, sp. nov.

(Fig. 132)

Host—*Caranx hippos*.

Habitat—Cyst in intestine.

Locality—New York Aquarium, Eastern Coast, U. S.

This worm was found in a cyst on the rectum of a *Caranx hippos*, common crevalle. On account of its rarity and unusual bothriæ it is thought necessary to put it on record. It has only two bothriæ which are placed flatly face to face, and resemble very much two flowers, and between these the proboscidae make their exit. The worm is 11.50 mm. long by 1 mm. wide. The proboscidae are protruded about 1.40 mm., and the bothria are 1.40 mm. wide. It is of course a cestode larva and

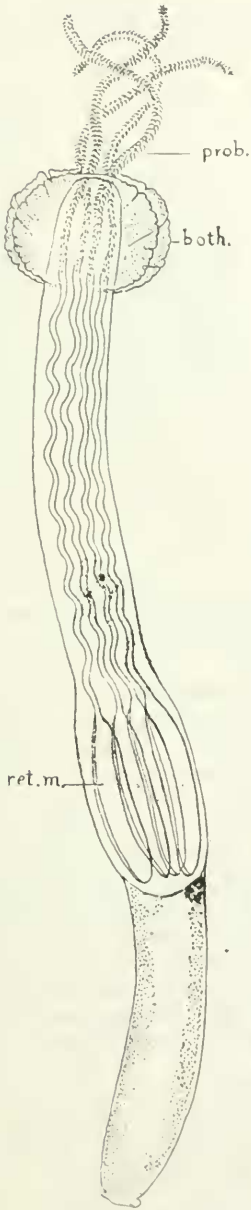


FIG. 132.  
*RHYNCHOBOTHRIVS CARANGIS*

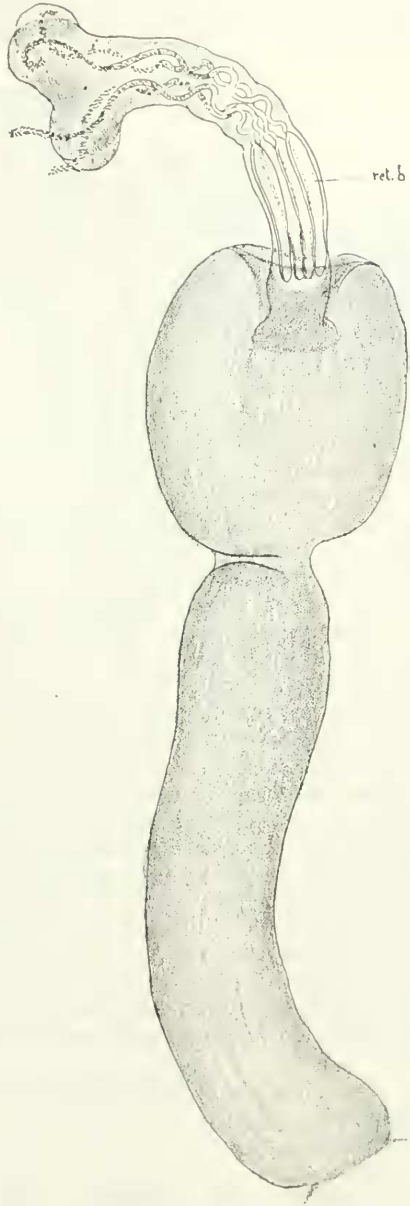


FIG. 133.  
*RHYNCHOBOTHRIVS TANGOLI*

was not found in its final host where it could be developed into an adult. The host came from the New York Aquarium, March 17, 1914.

*Rhynchobothrus tangoli*, sp. nov.

(Fig. 133)

Host—*Ikan tangol*.

Habitat—Peritoneum.

Locality—Bandjermassin, Borneo.

On July 1, 1916, this worm or larva was found by Dr. W. G. MacCallum, while dissecting a fish called by the natives *Ikan tangol*. It belongs to the mackerel family and is much thought of as a food fish. The worm is peculiar in its structure. The head, or anterior end, is a more or less rounded sac enclosing the clinging apparatus which may be protruded entirely from the sac through a sharply defined circular opening. It consists of a head portion which is divided into four bothria, separated by a central tube through which four proboscidae proceed anteriorly after crossing each other diagonally several times, until they reach the bothria where they separate one to each bothrium. Posteriorly, as in common with these worms or larvae, they are attached each to an elongated muscular bulb which has the power to force the proboscidae externally or to withdraw them at will. These proboscidae, as in this case, are armed throughout their whole length with powerful hooks arranged in lines. They can be plunged into any tissue and, what is strange, can be withdrawn quite as easily. This is a peculiarity of this class of worms of which there are many species, and the arrangement is perfect in holding the worm in position while its structure absorbs its nourishment from the fluids of its host. They do not live on the blood of the host for they have no sucking apparatus. They live rather like the *Taenia*, which they resemble in some particulars, especially the way in which they are reproduced. In the adult form, they have a body which develops segments, each one containing all of the genital apparatus for reproducing its kind and which when ripe are cast off to be taken in by its host, some fish or other aquatic form. In this case, beside the head and sac there is a prolonged body which shows striations, but they are not very regular divisions, nor do they contain visible rudiments of genital organs. The whole worm measures from an inch to an inch and a half in length, and the head sac is distinctly separated from the body by a decided neck or constriction.

*Measurements of R. tangoli.*

|   |                       |
|---|-----------------------|
| Length .....                                  | 25.00 mm. — 35.00 mm. |
| Width .....                                   | 2.00 mm.              |
| Head .....                                    | 3.00 × 2.5 mm.        |
| Proboscidae and muscular bulbs<br>about ..... | 4.00 mm.              |
| Across bothria .....                          | 1.00 mm.              |

## NEMATODES

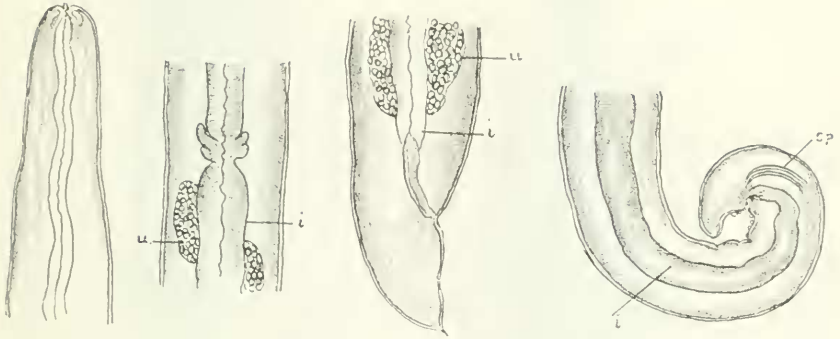


FIG. 134. *ASCARIS CEBI*

*Ascaris cebi*, sp. nov.

(Fig. 134)

Host—*Cebus capucinus*.

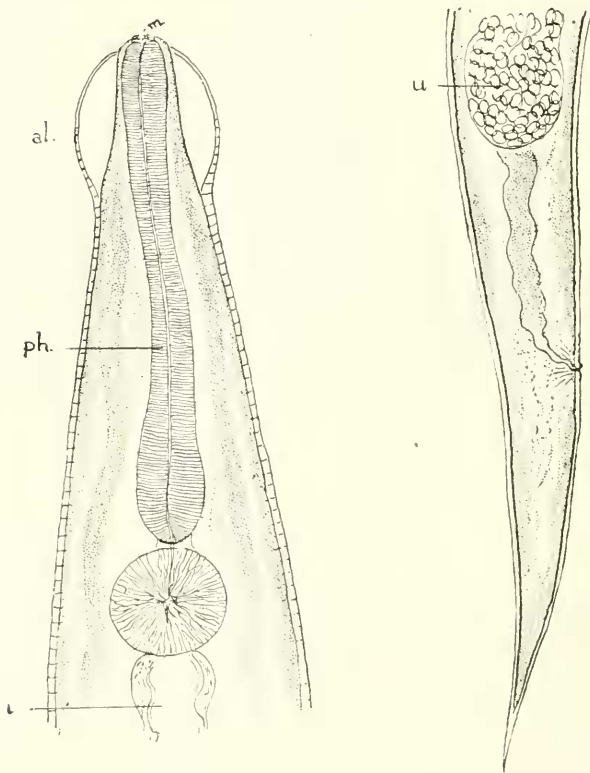
Habitat—Stomach and oesophagus.

Locality—Africa; Zoological Park, New York.

This little monkey, *Cebus capucinus*, was obtained from the New York Zoological Park, and was much emaciated and, as usual with animals or fishes or even plants when much below par, they become infested with other organisms than those which produced their anaemia and emaciation. In other words, in lowered condition, the animal offers a much lessened resistance to parasites. In the case of fishes, one seldom sees in nature a sick fish simply because, when ill they are more sluggish and less able to take care of themselves, consequently fall an easy prey to those larger fish which live upon them. Yet many fish suffer from ectoparasites or external enemies as *Microcotyle* on the gills, etc., which in numbers so exhaust the blood supply of the host as to cause death. This rule also holds good with reference to mammals, birds, etc., and it is almost the rule that one of these being out of health is a favorite breeding ground for lice and other parasites on the skin. A plant in lowered condition is almost sure to become infested with aphides and other parasites.

So this monkey with many different intestinal parasites beside the inordinate infestation of ascarids, became very thin and harbored great numbers of lice on its skin.

The ascarids, however, were the immediate cause of its death, for beside about a hundred tangled in a ball in its stomach, the

FIG. 135. *OXYURIS SIMIAE*

oesophagus was found stuffed with these and even some were found in the larynx. One was found actually coiled about the epiglottis so that the respiration was interfered with, and in patches the lungs were found collapsed and in some areas emphysematous.

The *Ascaris* was named *A. cebi* and this is perhaps only another synonym for *A. elongata*, Cobb. The female worms were stiff and much coiled and about 45 mm. long, and the males much slighter in form and 30 mm. in length.

The genital pore is about one-third the length of the worm from the tail. The eggs were very numerous. The anatomy is pretty well shown in the figures. The mouth end is the same in both sexes, but the posterior end is very different. The male shows several papillae both before and behind the anus and there are two short curved spicules.



*Oxyuris simiae*, sp. nov.

(Fig. 135)

Host—*Simia satyrus*.

Habitat—Colon.

Locality—Singapore.

In the intestine of a *Simia satyrus* at Singapore, there were found in the colon a lot of small *Oxyuridae*. They were very small and of a very delicate shape, nearly white in color. They are almost transparent. The mouth is terminal and surrounded by small papillae, not at all armed; it communicates with the pharynx by means of a long oesophagus, which terminates in a globular portion or valve. The wide intestine joins this directly by the intervention of a ring like structure. The vagina is at about the beginning of the posterior third of the worm. Eggs are small, yellow, and oval, tail very pointed, and the anus opens some distance from the tip, in a slit-like opening.

*Measurements of O. simiae*

|              |          |
|--------------|----------|
| Length ..... | 6.00 mm. |
| Width .....  | .30 mm.  |

Both sexes are much alike in appearance.

*Ankylostomum caninum*

(Fig. 136)

Host—Kampong dog.

Habitat—Intestines.

Locality—Bali.

At Bali, on June 2, 1916, there were found in a kampong dog's intestines a lot of *Ankylostoma*. They evidently are *A. caninum*. A sketch of them, male and female, is shown in Fig. 136. They show the three characteristic teeth in the upper jaw, one small; the female being 11 mm. long by .40 mm. wide and the bursa is .60 mm. in longest diameter, and it is so constructed that it may open to receive the female in its clasp, having five rays on each wall. The spicule is single and rather long. As will be seen by the plate, the pharynx is a long and very muscular structure. The intestines are long and much curled, and in the female much intertwined with the uterus.

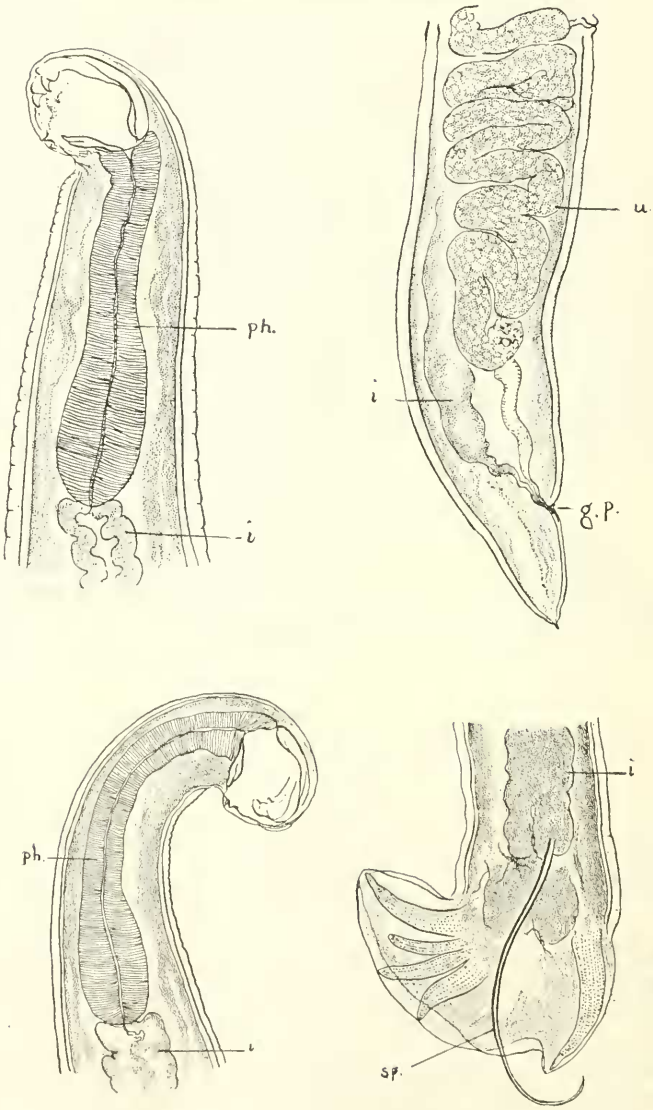
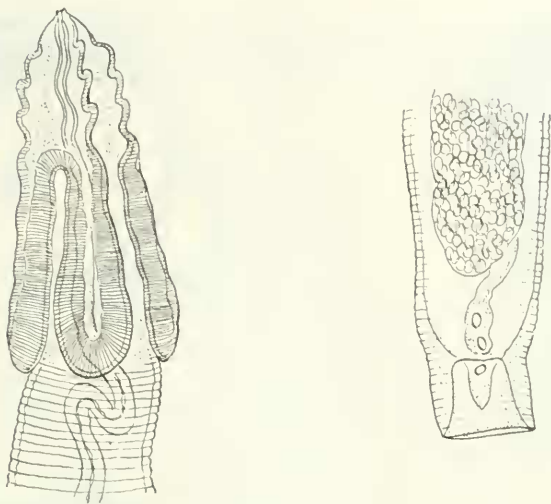


FIG. 136. ANKYLOSTOMUM CANINUM

FIG. 137. *DISPHARAGUS EGRETTAE*

*Dispharagus egrettae*, Rud. 1819.

(Fig. 137)

Host—*Egretta candidissima*.

Habitat—Intestine just posterior to the gizzard.

Locality—Zoological Park, New York.

These little worms were found in numbers on January 14, 1919, in that portion of the intestine just posterior to the gizzard. Some of them had their heads buried in the mucous membrane so far that they were removed with difficulty. There were no males found and it may be that, if they were very small, they were overlooked. As will be seen by the plate, the head is beautifully ornamented by four long, double, wing-like structures which to the worm are both useful as well as ornamental, for when buried in the mucous membrane, they would add much to its clinging power. These extend from the mouth towards the posterior .440 mm. expanding as they go until at the return bend they are .120 mm. wide. Their edges too are sharply notched, if they are not minutely spined. Across the base of what may be called the head, it measures .200 mm.

The oesophagus extends in a serpentine way from the mouth posteriorly and the mouth appears to be unarmed. The tip of the head is acutely conical and the sides of the head are margined by the ornamental structures which are wavy along the edge.

The posterior end of the female shows an odd cloaca containing both the genital pore and the anus in a cup-shaped structure, open

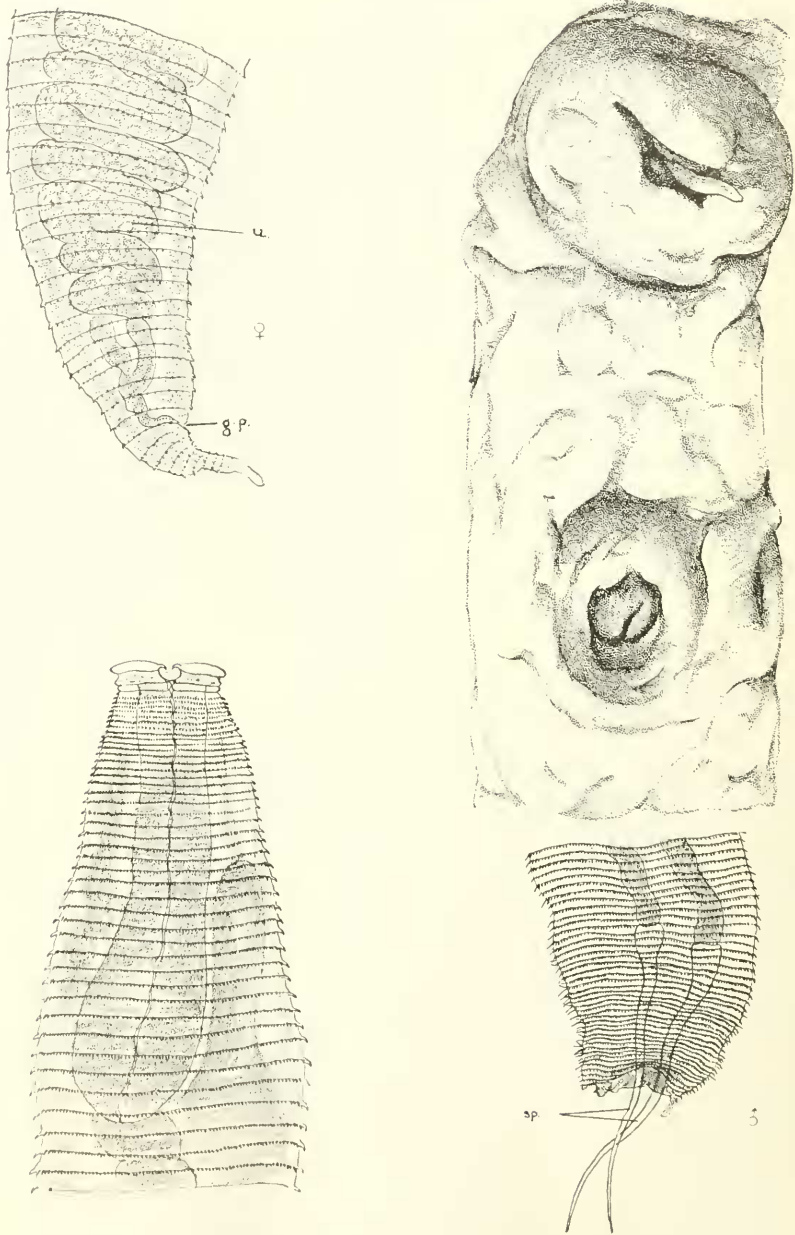


FIG. 138. *LECANOCEPHALUS ANNULATUS*

posteriorly. The other organs cannot possibly be made out in this material, for the body is literally filled with eggs. These are oval and colorless, .024 mm. long + .015 mm. wide. The body is from 10 — 11 mm. long and .440 mm. wide, and it is striated transversely throughout.

*Lecanocephalus annulatus*, Molin.

(Fig. 138)

Host—*Roccus lineatus*.

Habitat—Stomach.

Locality—Fish market, New York.

This worm, although small, undoubtedly is a serious pest to the fish it inhabits. Its mode of living is calculated to interfere very materially with the function of the stomach, inasmuch as it burrows under the mucous membrane, in fact excavating in some cases quite a space where several worms cohabit. The inlet to this habitation may not be large, yet as many as five or six worms have been seen with their heads protruding at the same time. This is probably done for the purpose of feeding on the chyme or contents of the stomach, for an examination of the contents of their intestines does not indicate that they live on the blood of their host. There are often several of these nests in the stomach, each nest may be 30 mm. to 40 mm. across, and as they cause a good deal of swelling and irritation, they may and do in some cases so restrict the cavity of the host's stomach that its food cannot be taken in any quantity sufficient to keep it alive. Thus the worms are a very serious menace to the fish. They are also quite cosmopolitan in their choice of a home, for they are found also in *Centropristes striatus*, sea bass, margate fish, *Hemulon album*, *Epinephelus striatus*, hake, alewife and many others (See Fig. 00.)

There appear to be three species of *Lecanocephalus*, *L. annulatus*, Molin; *L. spinulosus*, Dies.; and *L. kollari*, Molin. The present form seems to be the common one found in fishes of this continent. It is not large, the body is cylindrical tapering somewhat at each end and is covered with regular transverse rows of sharp spines, which all point backward.

The head is peculiar, having on each side of the mouth an overhanging plate of chitin with a sharp hook at the mouth end, apparently not for offensive purposes, but to retain the mouth or lips in contact with the mucous membrane. The mouth has three lips. The pharynx is a long, very muscular organ. The vulva is near the head. The sexes are separate and the female has a sharp pointed tail, spiny to the end, and the genital pore is a short distance anterior to the tip. The uterus is voluminous and it almost fills the abdominal cavity with transverse folds filled with eggs. The male posterior end is wide and has projecting from it two spicules which are not very

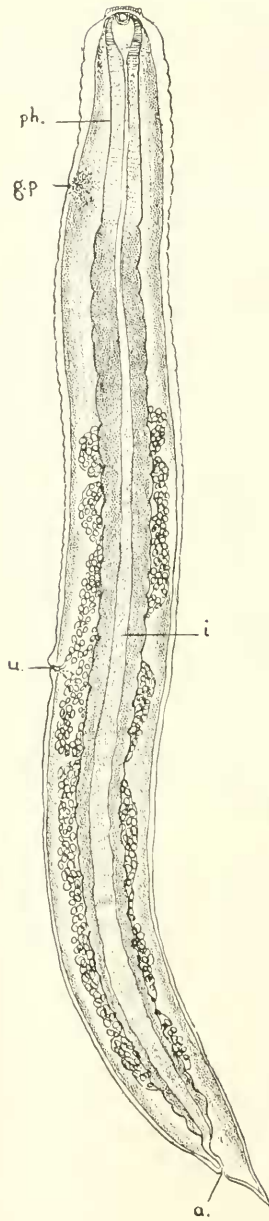


FIG. 139. *STRONGYLUS PATINI*



long. On its dorsal side is seen a short spine which is much larger than the usual spines covering the body. Other than this, the small spines in rows extend to the tip. Anal aperture in front of spicules oval in shape and marginal with very small, sharp spines. As usual with the nematodes, the females are much more numerous than the males, the latter being slightly smaller.

*Measurements of L. annulatus.*

|  |                      |
|--|----------------------|
| Females Length .....                   | 6.00 mm. to 7.60 mm. |
| Width .....                            | 1.00 mm.             |
| Males Length .....                     | 5.00 mm. to 6.00 mm. |
| Spicules .....                         | 2.00 mm.             |
| S. exerted .....                       | .400 mm.             |
| Terminal spine, end of male tail ..... | .040 mm.             |

*Strongylus patini*, sp. nov.

(Fig. 139)

Host—*Ikan patin*.

Habitat—Intestines.

Locality—Bandjermassin, Borneo.

This worm was found on July 1, 1916, at Bandjermassin, Borneo, in the intestine of a large fish called locally *Ikan patin*. There seems to have been only one found, although the notes say that there were three. This one is a female, containing a large number of eggs in the uterus. The mouth is armed in an unusual manner, as it is surrounded by a circle of prominent spines and the mouth is circular, emptying into a funnel-shaped gullet, and the whole terminating in a muscular pharynx such as is common in the *Strongylidae*. This terminates in a large intestine which is continued to near the posterior tip of the body. At a point nearly half the length of the body is the opening of the uterus or vulva from which the eggs are extruded, and near the head on the same side is an opening, the genital pore. The skin is a good deal corrugated, especially near the head, but it is unarmed. The uterus is voluminous and in this case is filled with oval yellow eggs.

The male has not been seen, but probably it is bursated.

*Measurements of S. patini*

|                                      |           |
|--------------------------------------|-----------|
| Length .....                         | 13.00 mm. |
| Width .....                          | 1.00 mm.  |
| Width of mouth, surrounded by spines | .240 mm.  |
| Eggs .....                           | .040 mm.  |
| Width of mouth proper.....           | .040 mm.  |
| Across head .....                    | .320 mm.  |

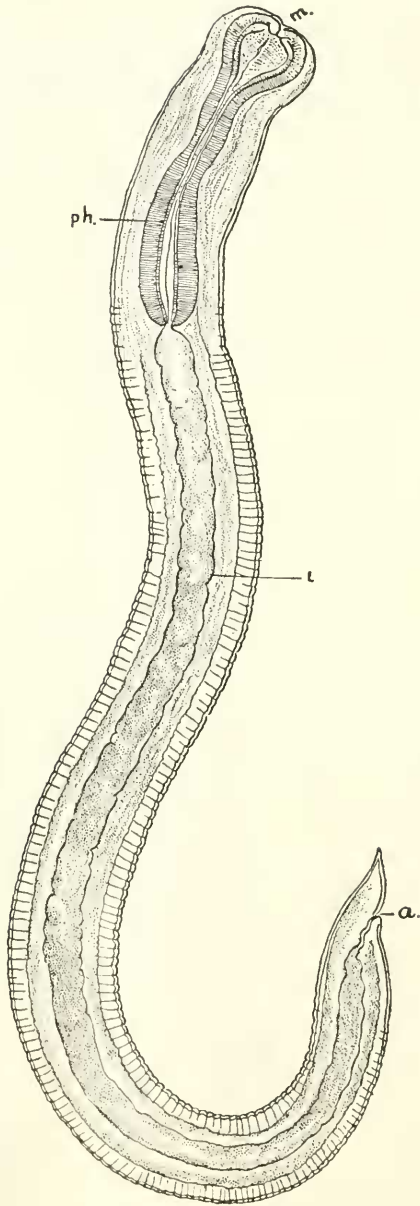


FIG. 140. *DACNITIS CARANGIS*

*Dacnitis carangis*, sp. nov.

(Fig. 140)

Host—*Caranx hippos*.

Habitat—Intestine.

Locality—New York Aquarium.

On May 29, 1917, there was found in the intestine of a *Caranx hippos*, crevalle, a small form which proved to be a *Dacnitis*. It is different in form of head to any hitherto seen and a sketch is given. The head is rather round, and when rendered transparent is seen to be composed of two armed jaws, which are capable of enclosing the upper part of the oesophagus. This latter also during its passage through the head portion is armed. The mouth proper is small and round, and is placed at the anterior end of the head. On each side, too, of the gullet is a semilunar space which is thickly studded with minute spines. The pharynx is a long, bag-like, muscular structure, down the centre of which runs the oesophagus which terminates in the intestine. This latter runs to the end of the tail almost.

The whole worm is small, being only about 10 mm. long and very delicately formed. It is striated transversely throughout the whole length from the end of the pharynx to the tip of the tail.

*Dacnitis sphaerocephalus*, Dujardin.

(Fig. 141)

Host—*Acipenser sturio*.

Habitat—Stomach.

Locality—New York Aquarium.

There were only two of these worms found in the sturgeon harboring them, and unfortunately they are both males. However, as they are rare, it is thought worth while to record the find. The female, as usual in the nematodes, is larger than the male, but the construction of the head is exactly the same, as is the rest of the anatomy, except of course the genitalia.

These worms are of separate sexes and are usually viviparous.

The mouth is an unusually muscular structure, but it cannot be said to be provided with lips. It is apparently the large end of a funnel-shaped gullet which ends in a very powerful pharynx. It, the gullet, is strengthened on each side by at least two strong longitudinal muscular rolls and on one side of the neck very near the head, there is a delicate structure which might be called a gland—a head gland with a long tube running posteriorly by the side of the pharynx. The skin is slightly and regularly striated throughout.

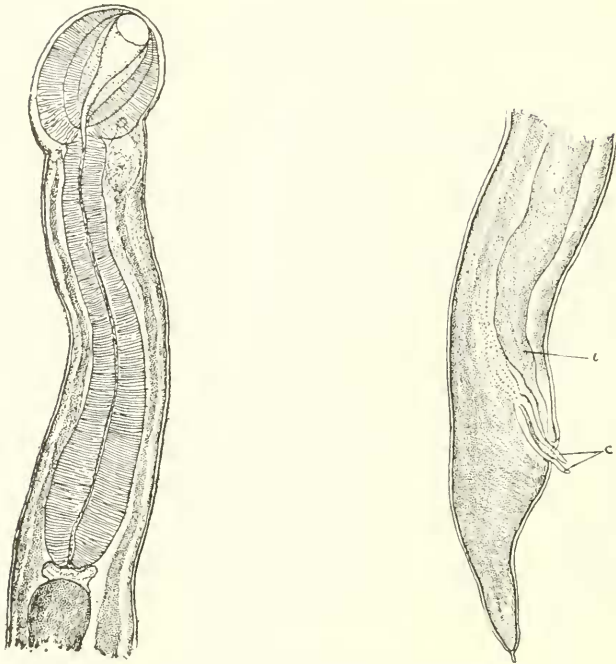


FIG. 141. DACNITIS SPHAEROCEPHALUS

The posterior end of the worm is usually coiled somewhat, and presents within .400 mm. of the tip, the anus and the protruding cirri, the anus in front. The cirri appear of an equal length, and form a triangular pointed organ which looks almost as if single. The spicules are not long and the papillae are so exceedingly small that they are seen with difficulty. In one case there are two pairs of preanal papillae of fair size, but if there are more, they are almost invisible. The post-anal ones also are very small, but there seems to be eight or ten pairs. The tip of the tail is surmounted by a short spike and just anterior to this are two pairs of what seem to be spicules a long way separated from the others.

*Measurements of D. sphaerocephalus*

|                             |          |
|-----------------------------|----------|
| Width .....                 | .280 mm. |
| Length of pharynx.....      | 1.60 mm. |
| Across base of pharynx..... | .040 mm. |
| Across head .....           | .400 mm. |
| Across neck .....           | .360 mm. |
| Across mouth proper.....    | .120 mm. |

*Echinocephalus aetobati*, sp. nov.

(Fig. 142)

Host—*Aetobatis narinari*.

Habitat—Spiral valve.

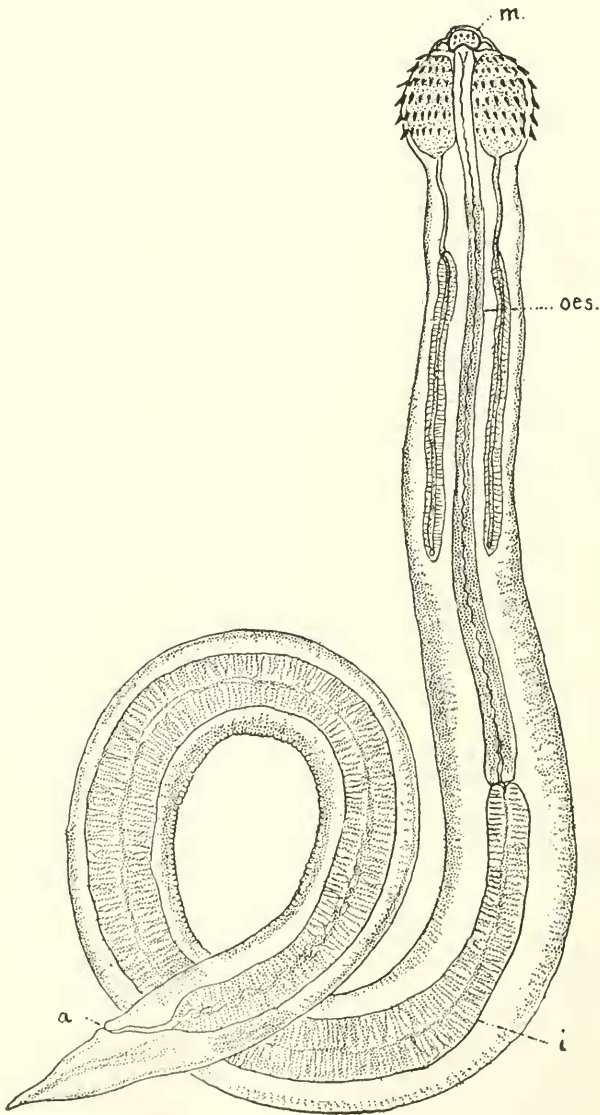
Locality—Batavia, Java.

This remarkable little nematode was taken from the spiral valve of an *Aetobatis narinari* at Batavia, Java, by W. G. MacCallum, on May 25, 1916.

Only one was found, and it seems to be a young and undeveloped female. I have a faint recollection that Monticelli described such a worm under the name *Echinocephalus striatus*, but I can find no literature on the subject, so think it best to put the find on record. As will be seen (Fig. 142), the head is the peculiar feature, being almost globular and surrounded by six transverse rows of spines. The mouth apparently is studded with spines. The anterior semi-circular lip has spines on its inner surface, and the lower triangular shaped lip also has spines on it. The mouth enters at once into a long oesophagus which is nearly half the length of the alimentary canal. On each side of the oesophagus, and within the globular-shaped head is a large rounded gland which may be called a head gland. These communicate by a narrow tube with two wide tubes or reservoirs, which extend nearly one-fifth of the length of the worm. The head was not sectioned so that it cannot be said certainly that there is any connection with the mouth, but the inference is that there is. In that case, the secretion probably has the same properties as that of many other nematodes—the *Strongylidae*, *Uncinaria*, etc., having a poisonous effect upon the host. The skin is closely striated transversely, but unarmed. Tail terminates in a spike and the anus is situated .320 mm. from the tip.

*Measurements of E. aetobati.*

|  |           |
|--|-----------|
| Length .....                               | 7.00 mm.  |
| Width .....                                | .360 mm.  |
| Neck .....                                 | .280 mm.  |
| Across mouth.....                          | .080 mm.  |
| Longest spines on the head.....            | .032 mm.  |
| Across head .....                          | .360 mm.  |
| Length of head.....                        | .240 mm.  |
| Length of narrow tube leading to reservoir | .200 mm.  |
| Length of reservoir.....                   | 1.120 mm. |

FIG. 142. *ECHINOCEPHALUS AETOBATI*



*Strongylus boae*, sp. nov.

(Fig. 143)

Host—*Boa constrictor*.

Habitat—Stomach.

Locality—Brazil.

These worms were found first in the stomach of a *Boa constrictor* from Brazil, and afterwards similar worms were found in the gullet of *Zamenis contortrix*, and in the stomach of a *Boa mexicana*, also in the stomach of a hog-nosed snake. They are all certainly alike, being more or less black throughout the greater part of the body, but the head and neck are white as is also a portion of the posterior end. The female is about 8 mm. long and the male 6 mm. The latter is provided with a copulating bursa which shows nine rays on a side and two spicules of about equal length emerging from the posterior part between the rays. The mouth is an unusual structure, being terminal, but immediately behind and connected with it are three short, longitudinal, chitinous pillars with apparent spaces between them, and the opening of the pharynx is at the base of these. The pharynx is muscular and is followed by a long stomach and intestinal tract, all of which are generally full of black material, probably partially digested blood. The anus is near the tip of the tail and the genital pore is about one-quarter of the length of the worm from the tip of the tail. The uterus is generally filled with numerous eggs of good size relatively. A large species of this same genus was found in the stomach of a *Python sebae* from the Congo. It was, however, yellow in color and was 15 mm. long for the female and 12 mm. for the male. Other than these differences the worms are very similar.

Stossich describes a strongyle female, no male, seen from an East Indian python. It only measures 7 mm. This he named *S. ersiliae*.

*Agamonema scorpaenae cirrhosae*, Dies.

(Fig. 144)

Host—*Scorpaena cirrhosa* (Cuv.)

During January, 1917, there were found in a *Scorpaena cirrhosa* two very small and delicately formed strongyles, male and female only about 10 mm. long by .20 wide.

Both sexes have the anterior end much curved. The mouth does not seem to be armed, but is terminal and circular or rather slit shaped. It opens into a long straight pharynx, which in proportion to its size, is quite muscular. The skin near the head is expanded

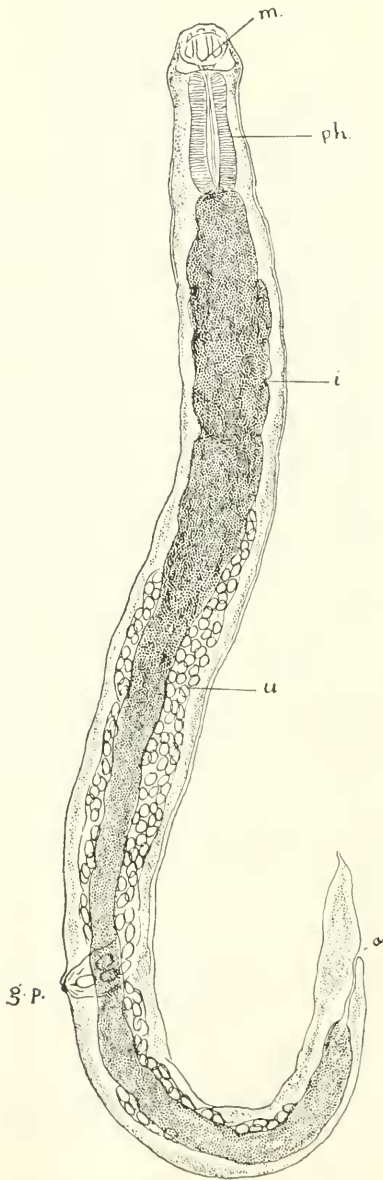
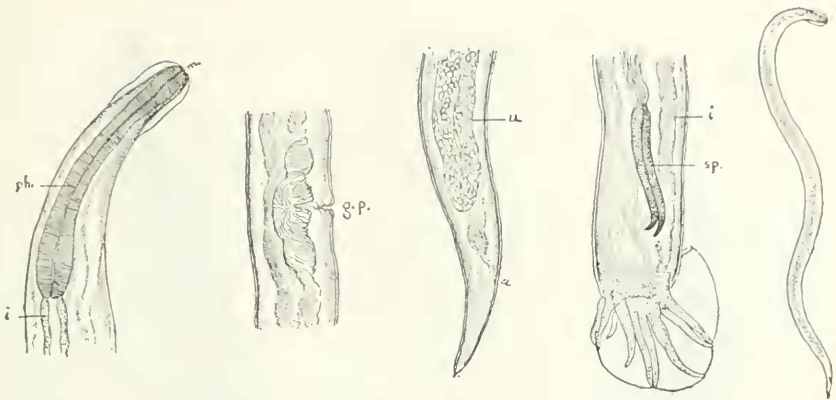


FIG. 143. *STRONGYLUS BOAE*

FIG. 144. *AGAMONEMA SCORPAENAE CIRRHOSAE*

from the head proper, apparently for the purpose of enabling the worm to retain its hold on the mucous membrane. At its junction with the intestine in both sexes there is a short, dark mass in each side of the intestine.

The genital pore or vagina is situated about one-third of the length of the worm from the tail. This locality is certainly peculiar. The vagina goes across the worm almost to the opposite side, entering a peculiar, large, lobulated mass which seems to be composed of numerous tubules, forming a beautiful structure which all finally terminates in the uterus. This organ is tubular and some of the coils extend quite towards the end of the tail. The anus is very near the tip of the tail, which ends in a very sharp spicule. The male has a delicately formed, small bursa containing about twelve rays. There are two spicules of a bright yellow color and comparatively thick. The two points of peculiarity in the anatomy of this worm are the structure of the mouth and the mass about the genital pore. The mass near the genital pore is .80 mm. across and 1.60 mm. in length. The cloaca is a relatively deep notch with swollen lips and the vagina extends into the mass to almost the whole width of the structure, and nearly the whole width of the worm, which is at this point 1.25 mm. It is unlike any structure observed in any known worm. No eggs can certainly be seen in this specimen. The worm may be a worm called *Agamonema scorpaena cirrhosae*, (Dies).

*Measurements of A. scorpaena cirrhosae.*

|                         |           |
|-------------------------|-----------|
| Length of female.....   | 10.00 mm. |
| Width of female.....    | 1.20 mm.  |
| Length of male.....     | 8.00 mm.  |
| Width of male.....      | 1.00 mm.  |
| Length of spicules..... | 1.20 mm.  |

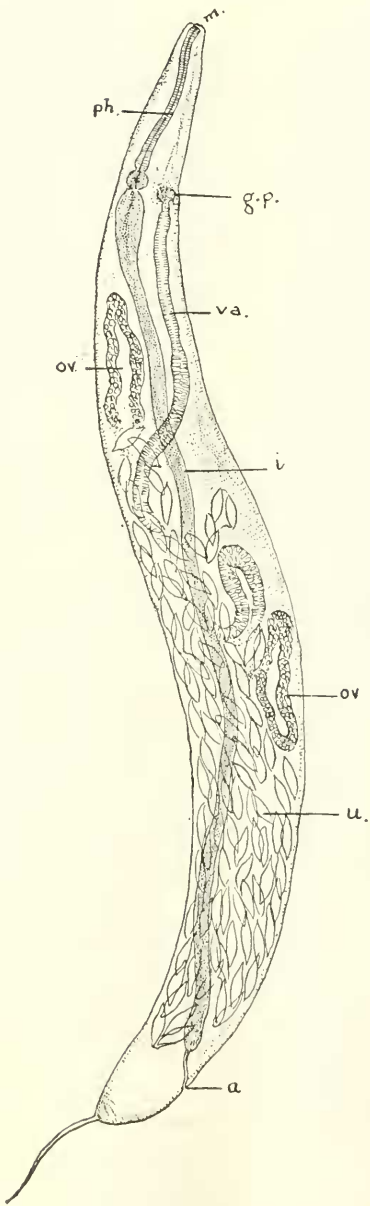


FIG. 145. *OXYURIS PTYCHOZOONI*

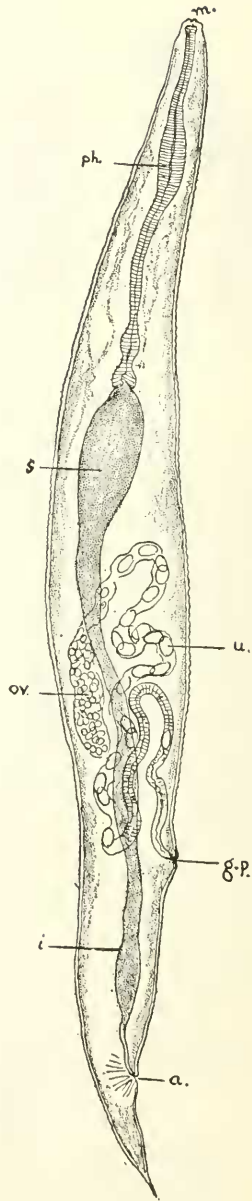


FIG. 146. *OXYURIS IGUANAE*

*Oxyuris ptychozooni*, sp. nov.

(Fig. 145)

Host—*Ptychozooni hemalocephalum*.

Habitat—Rectum.

Locality—Buitenzorg, Java.

On May 24, 1916, at Buitenzorg, Java, there were found a lot of small Oxyuridae in the rectum of a *Ptychozooni hemalocephalum*, a small leaf-like lizard. They are five or six millimeters long and only .20 mm. wide. There were no males among those examined. The females were filled with relatively large eggs, they being .600 mm. long  $\times$  .120 mm. wide. The worms are almost white and were rendered quite transparent. The mouth is terminal and surrounded by small papillae. The oesophagus is long and narrow, terminating in a round ball-like portion of the pharynx. This is followed by a narrow portion before emptying into the intestine. The anus is situated a short distance from the posterior end of the body. The genital opening is seen almost opposite the ball-like pharynx. At the end of the vagina there is seen a structure which is probably the ovary. The uterus fills almost the whole of the rest of the body cavity. The genital pore is posterior to the anus a short distance. At the posterior end of the body is a fairly long spicule, much like that in the *Oxyuris* of *Blattae orientalis*.

*Oxyuris iguanae*, sp. nov.

(Fig. 146)

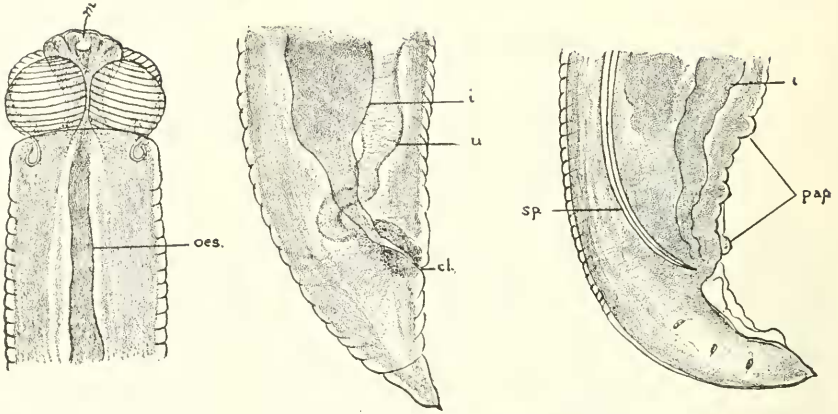
Host—*Iguana tuberculata*.

Habitat—Intestines.

Locality—Zoological Park, New York.

This small worm was found in great numbers in the rectum chiefly, of all the iguanas examined. It differs considerably from the Oxyuridae from other reptiles or animals from South America.

The most notable feature is the alimentary tract beginning with a small mouth which has many fine sharp denticles on the lips and also within the mouth. The pharynx which follows is exceedingly long relatively and widens at intervals. It is transversely striated like the pharynx of the strongyles, and on each side is to be seen a tube leading up to the head. It extends nearly one-third of the length of the worm and empties into a wide fusiform portion which probably serves as a stomach and this organ gradually narrows into an intestine which extends to nearly the posterior end of the worm, where it opens externally within a short distance of the sharp pointed tip. The genital pore is situated at about the junction of the posterior

FIG. 147. *ASCARIS TIARA*

quarter and anterior three-quarters of the length of the worm. The eggs are oval, large and few, and seem to need a metraterm to expel them from the uterus. The skin is smooth and finely striated throughout. The ducts seen on each side of the pharynx are probably analogous to the head and oesophageal glands seen in the strongyles, and probably have the same function. No males recognized.

*Measurements of O. iguanae*

|                     |                 |
|---------------------|-----------------|
| Length .....        | 7.00 mm.        |
| Width, maximum..... | .80 mm.         |
| Eggs .....          | .120 × .080 mm. |

*Ascaris tiara*, v. Linstow, 1879.

(Fig. 147)

Host—Monitor, *Varanus salvator*.

Habitat—Intestine and Stomach.

Locality—Buitenzorg, Java.

On May 27, 1916, a lot of these worms were found in a large monitor and although this worm was first discovered and described by V. Linstow, having found it in a *Varanus ornatus*, Daud. in Natal, Africa, it has been thought worth while to record this one. The fact that it was found in another species of *Varanus* and in Java, geographically, so far distant from those found in Natal, makes it necessary to report it. Beside the above reasons, it is not very easy to find a good figure of the worm, and as it will be seen at once, it is very different morphologically from any other *Ascaris*. I may



say that I have no literature on the subject so am not sure that it is an *Ascaris* at all.

The head is a very odd structure which once sunken into the mucous membrane of the intestine would be a very efficient attachment in addition to its ornamentation.

The worm is whitish in color and as usual the female is larger than the male. There is a considerable difference in the size of the worm from *V. ornatus*, and this species from *V. salvator*, those as given by Von Linstow from *V. ornatus* being female 28 mm., male 20 mm., while the worms from *V. salvator* are female 37.50 mm., male 30 mm.

The cloaca is on the ventral side near the posterior end. In the female the end of the body terminates in a short strong spine. The male has a number of papillae near the posterior end four of which are larger than the rest, and three are preanal and four of varying size post-anal, while along each side are three more. These latter are small. There is also a sort of membranous trough or bursa between the anus and the tip of the body. The cirri are as Linstow says, sabre-form. The skin is deeply striated and the bulbous lips at the head are striated. The skin is thick. The eggs are numerous and fairly large, and rather round.

*Measurements of A. tiara.*

|                      |           |
|----------------------|-----------|
| Length .....         | 37.50 mm. |
| Male .....           | 30.00 mm. |
| Width .....          | 1.50 mm.  |
| Across head .....    | .480 mm.  |
| Across each lip..... | .240 mm.  |

*Sclerostomum tribulbocapitis*, sp. nov.

(Fig. 148)

Host—Blanding's turtle.

Habitat—Stomach.

Locality—Ohio.

These worms were found at Wood's Hole on August 5, 1919, in the stomach of a Blanding's turtle and in one case had formed a cavity or nest under the mucous membrane, and in every case where they were attached to the membrane, they had sunk their triangular lobulated heads quite deeply beneath the mucous lining.

It is not a very large worm, nor was it found in great numbers, one or two pairs at most in each host. In size, it is male 24 mm. long, female 25 mm. and quite slender. The head is triangular in shape, in fact seems to be composed of the three globular masses

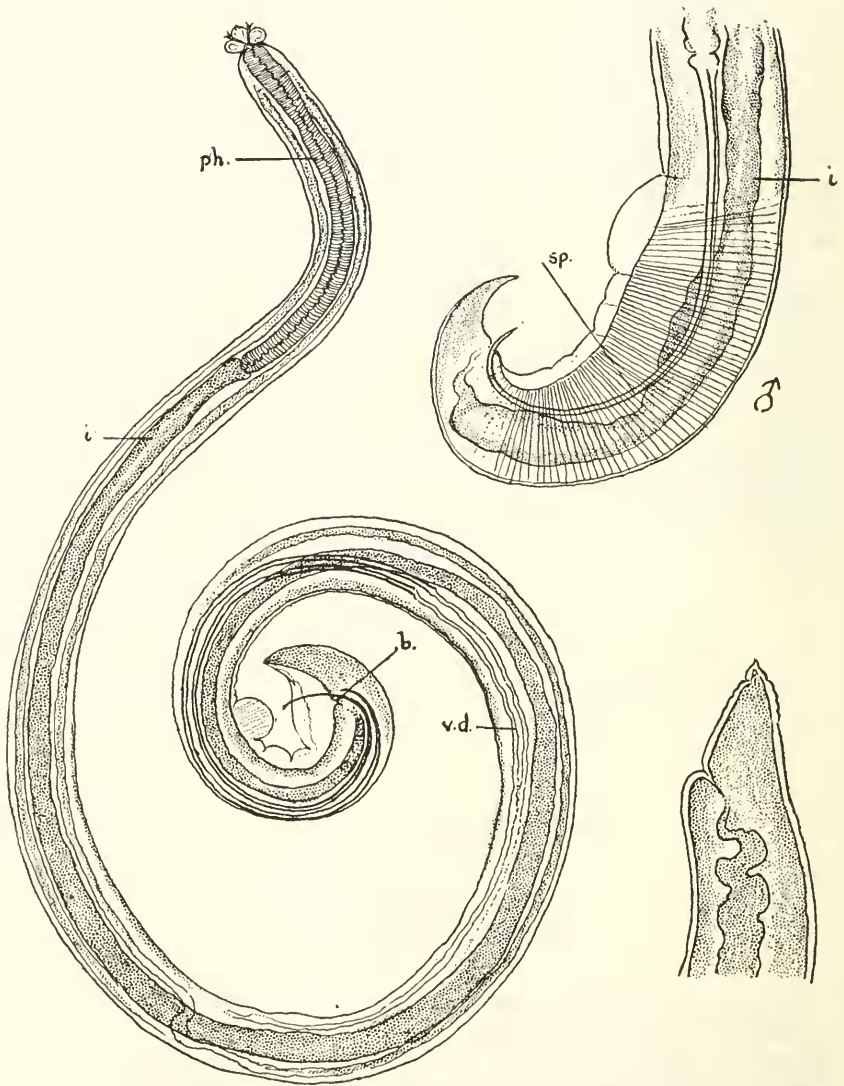


FIG. 148. *SCLEROSTOMUM TRIBULBOCAPITIS*

joined together, and separated from the body by a very decided neck. The mouth part, opens apparently by the upper jaw, raising perpendicularly and the two globular masses at the sides being the angles. A long oesophagus follows the mouth and on each side of this is a tube, called the head gland in these worms and which in some cases gets the credit of carrying a noxious or poisonous fluid to the parts incised by the jaws.

In the case of the female the genital opening appears to be situated near the centre of the length of the worm. The anus is at the posterior, very near the end. No eggs are seen but the uterus is filled with larvae.

The male is nearly as long as the female and is supplied with a complicated bursa and two long spicules. The tail of the worm extends curved, and a membrane which is double, surrounds the tip and extends anteriorly, widening as it proceeds, and directly at the end it narrows and becomes attached to the body, a shell-like transparent structure intervening. Near the tip of the body itself are shown several prominent spikes standing out on the surface, three on the outer curve, and five within the curve, one being anterior to the outlet of the spicules. The spicules arise from among them near the end and at their interior end the testes may be seen attached to the spicules, the whole end forming a complicated and beautiful structure.

*Measurements of S. tribulbocapitis.*

|                            |                       |
|----------------------------|-----------------------|
| Length .....               | 24.00 mm. × 27.00 mm. |
| Width .....                | 1.00 mm.              |
| Across head .....          | .12 mm.               |
| Immediately behind head... | .20 mm.               |

*Sclerostomum lopholatilus*, sp. nov.

(Fig. 149)

Host—*Lopholatilus chamaeleonticeps*.

Habitat—Intestine.

Locality—New York Aquarium, New York.

These odd little worms were found on October 26, 1915, in the intestine of a tile fish. They were found firmly adherent to the mucous membrane.

The mouth is surrounded at the lips by a circle of evenly placed spines which enables the worms to retain their hold while deriving their nourishment. The oesophagus is very muscular and seems to extend to the mouth without the interposition of a pharynx. The oesophagus however widens near the mouth and contains three tubular structures which may be suckers. These are unusual organs.

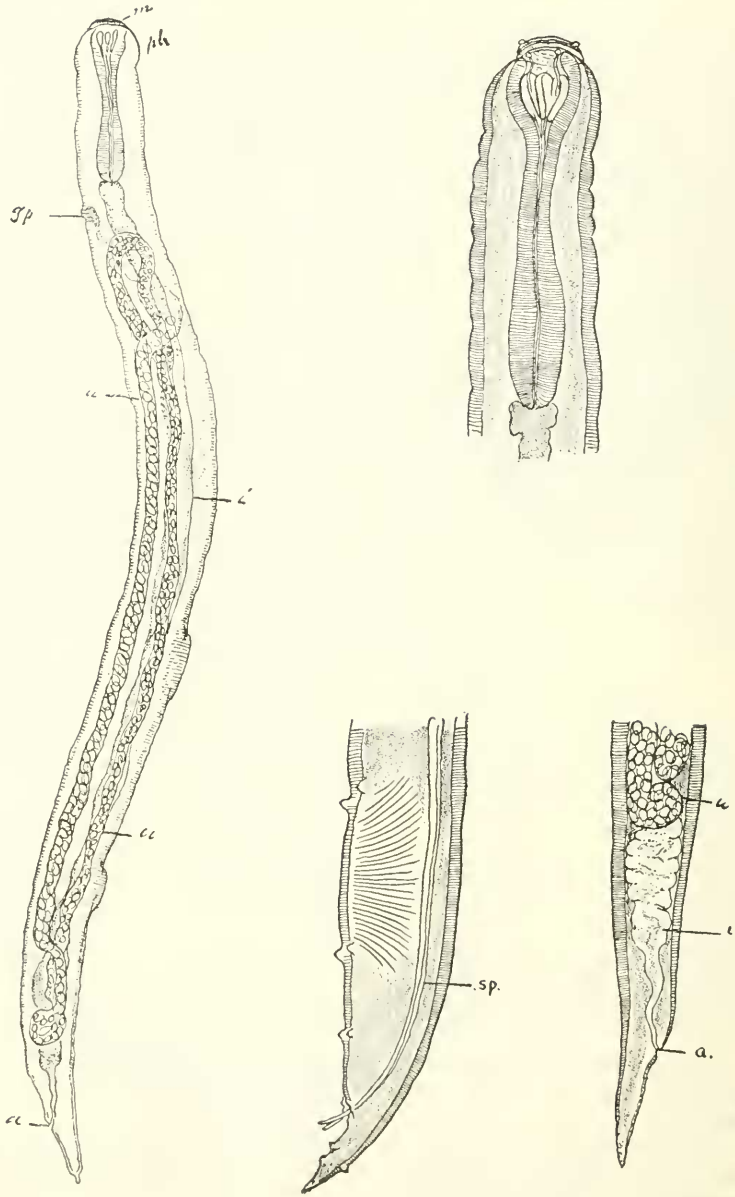


FIG. 149. *SCLEROSTOMUM LOPHOLATILUS*

The uterus filled with large round eggs extends from its outlet, the genital pore, to near the anus and occupies the greater part of the abdominal cavity. The genital pore is situated near the posterior end of the oesophagus.

The skin is thick and is striated with deep transverse lines. The anus is very near the posterior end of the body which terminates in a sharp point.

The male is much smaller than the female, being only about half its size. It has a coiled tail and on the ventral side of the posterior end are five pairs of pointed papillae and one on the dorsal side near the tip. Near the tip also two spicules make their exit. They are proportionally

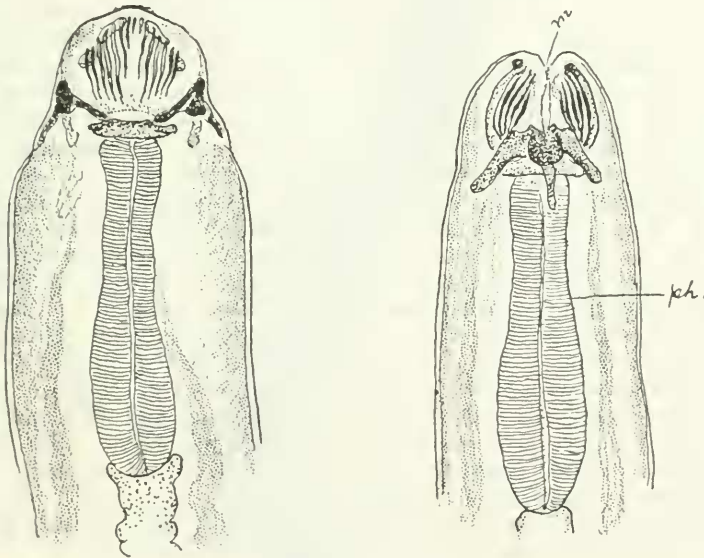


FIG. 150. *CAMALLANUS TESTUDINIS*

long but there is no bursa. Between the two first pairs of papillae there are a number of transverse muscular striae, used for holding purposes during coition.

*Measurements of S. lopholatilus.*

|                                 |               |
|---------------------------------|---------------|
| Length of female.....           | 10.00 mm.     |
| Width of female .....           | .5 mm.        |
| Length of male .....            | .6 mm.        |
| Width of male .....             | .250 mm.      |
| Across head back of mouth ..... | .5 mm.        |
| Width of mouth .....            | .250 mm.      |
| Eggs .....                      | .06 × .04 mm. |

*Camallanus testudinis*, sp. nov.

(Fig. 150)

Host—Blanding's tortoise.

Habitat—Stomach.

Locality—Ohio.

This little *Camallanus* was found in varying numbers in almost every specimen of seventeen Blanding's turtles which were examined, but never in very great numbers as *Camallani* are sometimes seen in other hosts. They were chiefly located at the entrance of the stomach and end of the oesophagus.

They were generally found with the head firmly embedded in the mucous membrane. They were reddish in color when first collected but the pink tint soon faded after exposure to the air. They did not seem to have withdrawn blood, for the contents of the intestines were not black. The mouth is of much the same structure as usual except that it was in these often found closed from side to side,—that is, the chitinous teeth came together in a line from the mouth to the throat, thus showing the way in which the mucous membrane is broken or bitten. As a reference to the plate will show, an old u-shaped structure, not seen in any other plate, is also plainly to be seen, perhaps, only brought anteriorly to view, when the mouth is closed. Its function may be to facilitate the sucking process. The rest of the anatomy of the body seems similar to most of those *Camallani* described in *Zoopathologica*, Vol. 1 No. 5, July 1918. The uterus, in almost every case, was filled with larvae of different degrees of development. They varied in length from .02 mm. to .03 mm. long and .002 mm. wide. The head always shows a little wider than the body. The vaginal opening is situated about the middle of the length of the body of the adult female, and presents swollen lips.

The female is generally about 14 mm. long and the male about 7 mm. long. The female is nearly twice as wide as the male.

*Sclerostoma eustreptos*, sp. nov.

(Fig. 151)

Host—*Ophibolus getulus*.

Habitat—Lung.

Locality—Zoological Park, New York.

This little worm of which there were a number found in the lung of a king snake, *Ophibolus getulus*, on July 25, 1919, from the Zoological Park, N. Y., is of such remarkable conformation that it becomes necessary to describe it. This is not very easy on account of its shape, however, the mouth is more or less circular and is armed on the



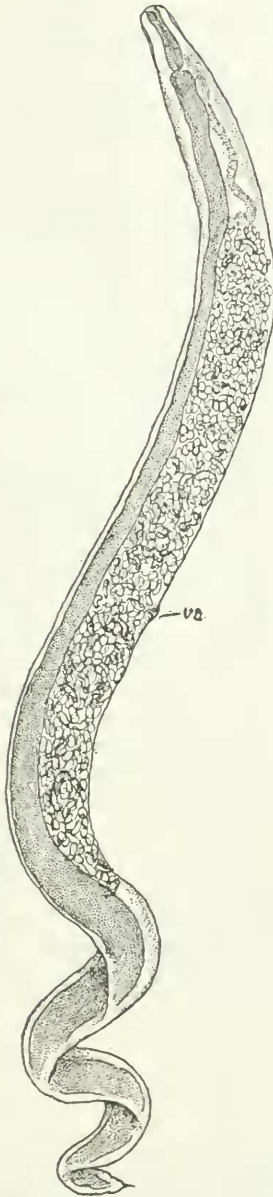


FIG. 151. *SCLEROSTOMA EUSTREPTOS*

inner margin of the thick lips with a row of small teeth. The oesophagus or pharynx is flask-shaped and anteriorly it extends to the lips, the posterior portion is widened and the length of this cross striated muscular portion is .40 mm.  $\times$  .10 mm. wide. It terminates in the intestine without any great enlargement on the part of the intestine, this latter is filled with granular matter and it widens somewhat as it proceeds posteriorly. It preserves its light color for a certain distance but then becomes pigmented and remains so almost to the end of the body, showing a distinct line of demarcation between it and the generally over-distended uterus. It is not so much pigmented, however, that the eggs may not be seen through it, while it overlays that portion of the uterus which is filled with larvae. It terminates at the anus, which is very near the tip.

Near the anterior end may be seen what appear to be the ovary and testis, both in the form of tubes filled with granular matter. They extend to within a short distance of the posterior, or flask-shaped end, of the oesophagus, and pass behind the uterus towards the posterior end. A very narrow tube may be seen to pass on each side of the oesophagus quite to the margin of the lips. They seem to be filled with fine granular matter which may be projected into the wound made by the bite of the worm, possibly with toxic effect. There is no pharynx. The worm is viviparous and the uterus crowded with larvae fills the greater part of the body. These latter have a distinct shaped head and a sharp tail and exist in myriads. There are also eggs in all stages of development, from the freshly formed to the fully developed larvae. The genital pore is situated about the middle of the worm on the uterine side. The peculiarity in the anatomy of the worm is that about one-fifth of its length posteriorly is in the shape of a cork screw, and besides the margins of this section are membranous and transparent. The tip terminates in a sharp spine. No separate male was seen.

*Measurements of S. eustreptos.*

|                                   |                  |
|-----------------------------------|------------------|
| Length .....                      | 7.00 to 8.00 mm. |
| Width .....                       | 1.00 mm.         |
| Width, across head.....           | .50 mm.          |
| Length of muscular oesophagus..   | .40 mm.          |
| Length of partly developed larvae | .20 mm.          |

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## A BOT-FLY PARASITIC IN MONKEYS\*

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Bureau of Entomology, U. S. Department of Agriculture

(Figs. 152-153).

Two great rarities have recently been received by the U. S. National Museum, which, combined, add some very valuable information to our knowledge of the Cuterebrine bot-flies.

The Cuterebrinae apparently are peculiar to America. Five genera, *Dermatobia*, *Pseudogametes*, *Rogenhoferia*, *Cuterebra*, and *Bogeria* are included in the group. *Dermatobia* has a wide variety of hosts, parasitizing man, monkeys, dogs, cattle and birds, but the others (except for the unknown habits of *Rogenhoferia*) seemingly are addicted to the use of rodents and opossums for their hosts. Occasionally, individuals of the Cuterebrini will be found parasitizing other hosts, as cats, dogs and hogs, but these cases are regarded as accidental.

The material now at hand shows that certain Primates may serve as natural hosts for at least one species of *Cuterebra*. This exceptionally valuable material consists of two lots, the first being the neck portion of the hide of a howling monkey (*Alouatta palliata inconsonans* Goldman) which is so heavily infested with the bots that the hide has the appearance of a collection of cells in a bumble-bee's nest. This specimen was collected by the late Mr. J. L. Baer of the "Marsh Darien Expedition," in Darien, Panama.

The second lot of material was collected at Kartabo, British Guiana, by Professor Alfred Emerson of the Pittsburg University. It consists of two reared adults and a number of larvae taken from the howling monkey of British Guiana.

Apparently the howling monkeys are heavily parasitized by these bots. Emerson reports that they are numerous in the monkeys, usually in the region of the throat; and Goldman states in his "Mammals of Panama" (Smithsonian Miscellaneous Collections, 69, 1920, 229) "All of the specimens of (*Alouatta palliata inconsonans* Goldman) obtained, carried numerous large larvae of flies, mainly in the skin on the throat, which added materially to their repugnant appearance. These larvae were not found on the spider monkeys taken in the same vicinity. Perhaps the greater activity of the latter may prevent the deposition of eggs."

The fact that the bots are usually found in the region of the throat may afford a clue as to the method in which the monkeys become parasitized. Very little is known of the egg laying habits of the Cuterebrae but from what is known it appears that the female lays the eggs about the haunts of the hosts, perhaps on the leaves of plants. The eggs may then be eaten along with the leaves by the host animal and the larvae immediately upon being taken in the mouth probably emerge and begin to penetrate the tissues of the mouth, then

\* Contribution, Department Tropical Research No. 195.



FIG. 152. A RED HOWLER MONKEY INFESTED WITH BOTS  
 Photograph from a specimen collected by Alfred Emerson at Kartabo, Bartica  
 District, British Guiana.

working their way through the flesh, they come to the skin of the host through which a breathing and exit hole is made. There they stay, in a pocket just beneath the skin, until full-grown. Upon emergence they fall to the ground where they pupate.

The material recorded proves to be a new species, and is here described under the name of *Cuterebra baeri* Shannon and Greene. The adult specimens have been selected as the types.

*Cuterebra baeri*, Shannon & Greene, sp. nov.

Fig. 153

*Larva*.—Typical form of *Cuterebra* (a) black, very rugose subshining, slightly flattened and slightly pointed towards the cephalic end. Nine visible segments besides the small head segment which is generally retracted. The chitinous dermal appendages completely cover the surface of the larva. These appendages are broadly rounded, flattened and fitted in shingle fashion (b). On the anterior two-thirds of each segment these dorsal appendages are directed backward; the edges of these appendages are yellow and smooth; here and there is an appendage having fine irregular teeth along the edge; then there is a single row of underlying appendages and from this row backward, covering the basal third of each segment, these dermal appendages are directed forward and all have fine, irregular teeth along the edge. Head segment and area around it luteous. From in front the head segment appears like two small, rounded lobes with the surface scale-like; each lobe has two microscopic tubercles, one above the other, on the anterior surface. Beneath each of these two cephalic lobes is a large, well-developed mouth hook. Anterior spiracles are of an orange color, large, elliptical and made up of closely set hairs resembling a broad flat brush. Posterior end (c) depressed into a shallow cavity around the edge of which the dermal appendages are not so broad but the teeth are more prominent. Spiracular plates (d) are about twice as long as wide and separated by a fine lyrugose, raised area; surface of each plate with a faint, indefinite



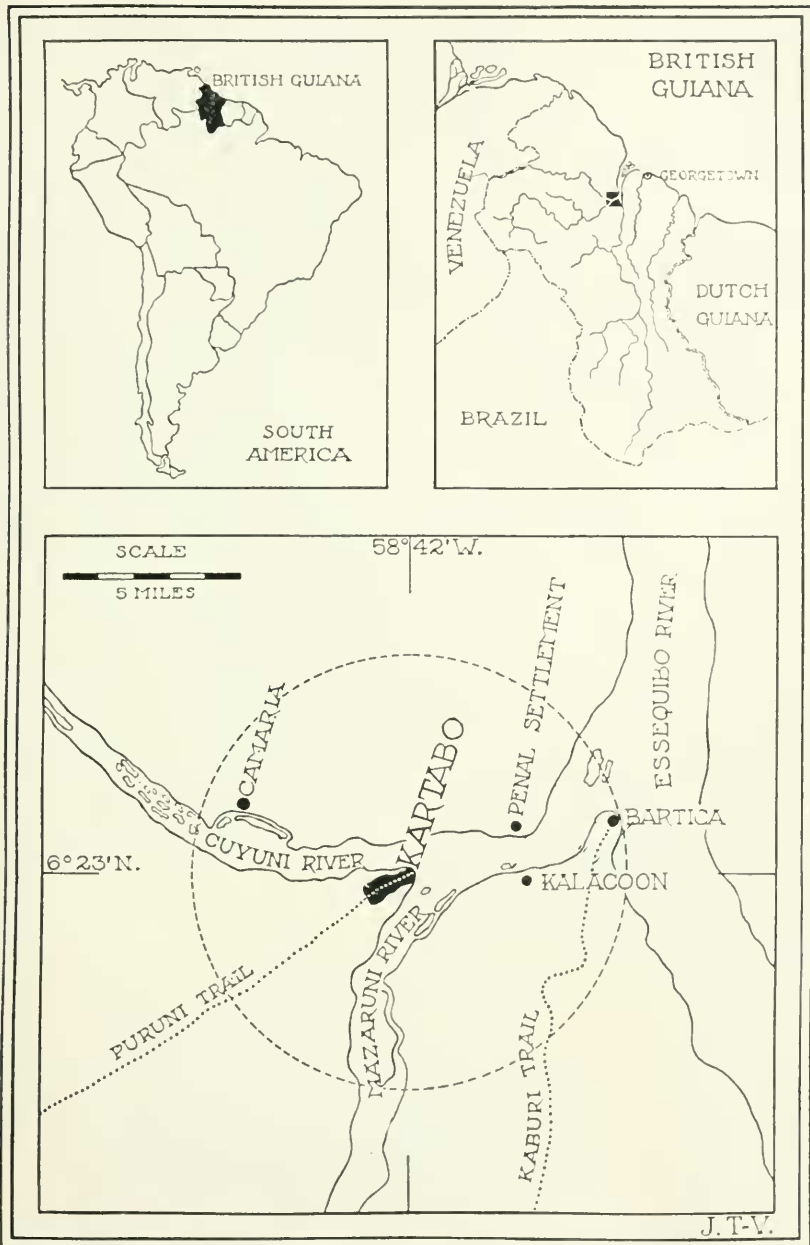


Plate A. British Guiana Tropical Research Station of the New York Zoological Society. Circle represents a radius of six miles.

Drawing by John Tee-Van

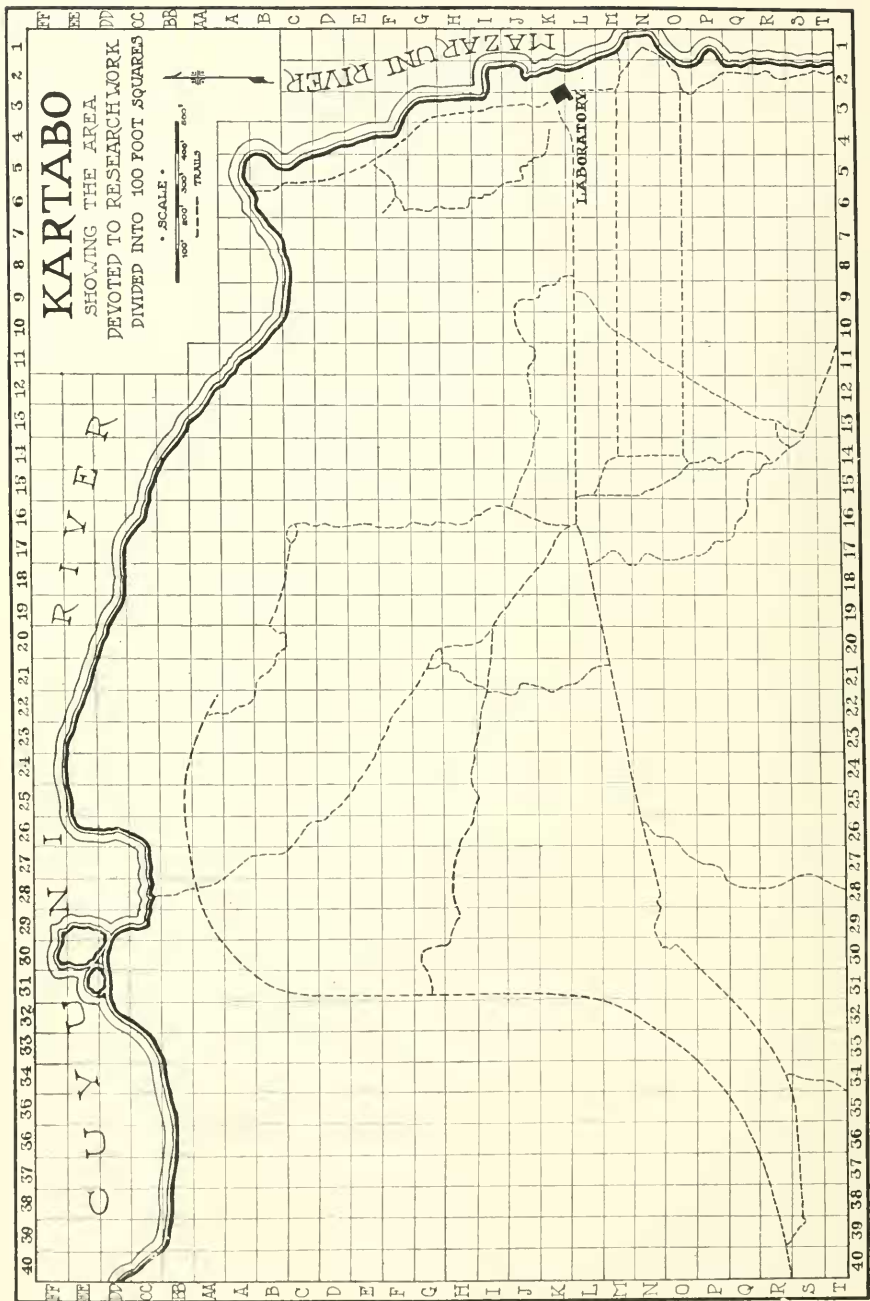


Plate B. Area devoted to research at Kartabo.  
 Drawing by John Tee-Vau.

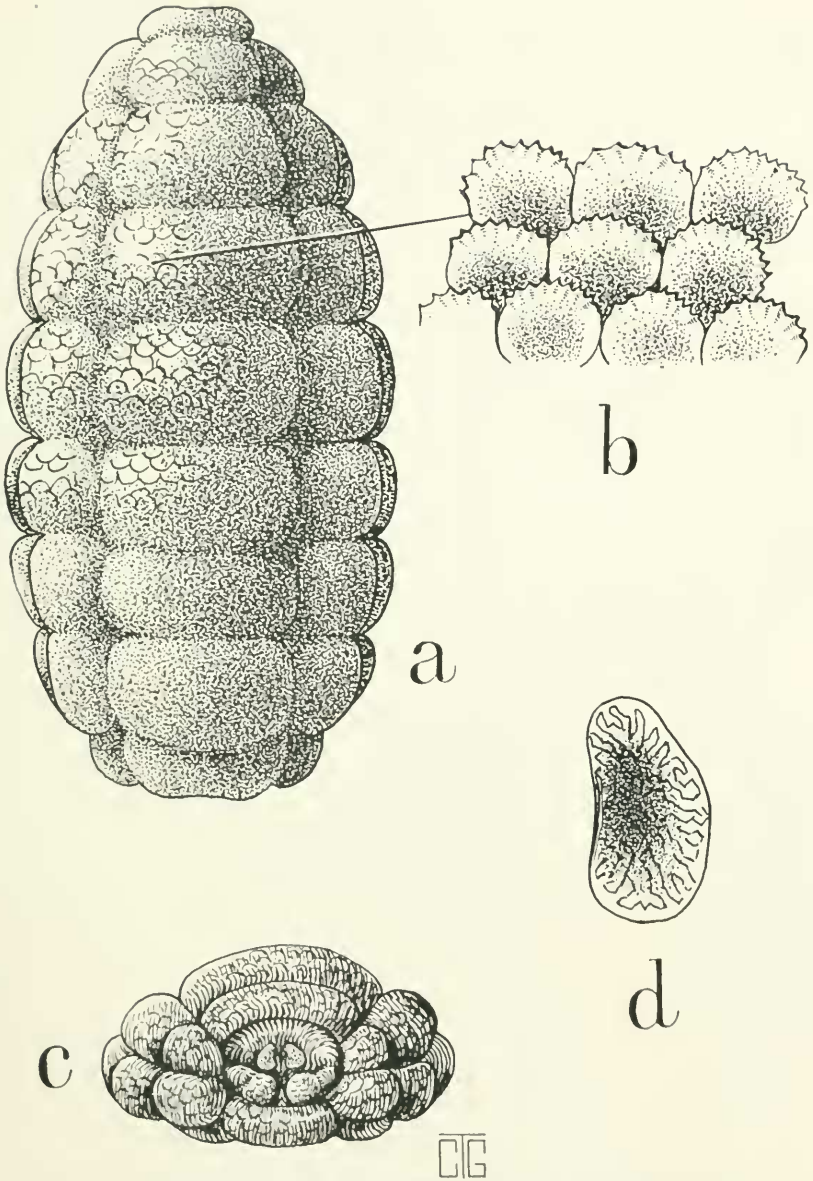


FIG. 153. *CUTEREBRA B. IERI*, SHANNON AND GREENE, SP. NOV  
From a Pen Drawing by C. T. Greene.

depression in the central area; the slits are quite indistinctly broken and of the serpentine type; no button; area around the spiracular plates shining with numerous rugosities and the surface with scattered, sharp pointed spines. Below each spiracular plate is a large rounded, raised surface with the surface having a scale-like appearance.

Length 22-27 mm., width 15 mm.

This type of larva is easily separated from other *Cuterebra* larvae by the dermal appendages being scale-like while in the other *Cuterebra* species the dermal appendages are cone-like and sharp-pointed at the apex and not so closely set together.

"Larvae emerged from red howling monkey on 12. VII; 1924. Probably pupated 12. VII, 1924."

*Pupa*.—About the same as the larva except the segmentation is slightly more pronounced.

*Adult*.—*Cuterebra baeri*, new species. Female: The species appears to be intermediate between *Cuterebra* Clark and *Bogeria* Austen as defined by Townsend. The peristomalia distinctly converged as in *Cute.ebra* but the antennal pit is circumscribed below as in *Bogeria*. In general coloration it is nearly entirely dark, and without grayish pollinosity, thus appearing closest to *Cuterebra tenebrosa* Coquillett, a western United States species which is usually found around the nests and burrows of pack-rats (*Neotoma*). Apparently no Neotropical species has this type of coloration.

Head entirely black; frontal triangle subtriangular, the apex not unusually produced; third antennal joint about two and one-half times longer than broad; arista fairly long; thoracic pile entirely black, very short on disc of mesonotum; legs black with black pile and strong hairs; abdomen black with basal dark brownish bands on second and third tergites; wings yellowish-brown basally and on basal three-fourths of anterior margin; tip of wing smoky and remainder of wing hyaline.

Length, about 18 mm.; wing, about 15 mm.

*Type locality*.—Kartabo, British Guiana, July 22, 1924.

*Type*.—Cat. No. 28163, U. S. N. M.

Female type, female paratype, both reared specimens, and a number of larvae, obtained from the red howler, *Alouatta* species (collected by Alfred Emerson). Also a large number of larvae, probably the same species, in the hide of the Panama howler, Darien, Panama, 1924 (collected by J. L. Baer).

Only one other species of *Cuterebra*, *maculosa* Knab, has been recorded from Panama. It differs by its much larger size and the presence of maculated pollinosity on the third tergite. The dark color of *Cuterebra baeri* will serve to separate it from all other Neotropical species.

Named for the late Mr. J. L. Baer of the Smithsonian Institution, who collected the specimen recorded above shortly before his untimely death.

## A NEW ECTOPARASITIC TREMATODE

*Epibdella melleni*, sp. nov.

BY G. A. MACCALLUM, M.D.

(Fig. 154)

A consignment of spade and angel fishes, was received from the Florida coast waters at the New York Aquarium in the early summer of the year 1926, and in a short time it was observed that the eyes of many were diseased. Miss Ida Mellen, who studied these fishes, discovered that there were parasitic worms which attacked and destroyed the cornea. It appeared that the parasites were introduced into the tanks by a Pacific puffer (*Spheroides annulatus*) which came from southern California, but other fishes such as the spade fish (*Chaetodipterus faber*), and various species of angel fishes (*Angelichthys* and *Pomacanthus*) became infected. The lodgement of the worms is perhaps favored by the fact that the Pacific puffers have eyelids which can be closed over the eyes so that the worms can adhere within the conjunctival sac formed in this way. Several may thus be lodged on each eye of the puffer but not so many on the angel and spade fishes.

They are small, white, smooth trematodes, concave on the under surface and able to adhere strongly by their suckers. The cornea is pierced or eaten through in some way and in about three weeks the eye thus laid open to the exterior is destroyed.

It was found upon study of the worm that it corresponds in a general way with those described under the name *Epibdella* and since it was found by Miss Mellen, the name *Epibdella melleni* is suggested in her honor.

The worms vary greatly in size, some measuring not more than  $1\frac{1}{2}$  mm. in length while the largest one found measures  $5 \times 3$  mm. They are rounded or elliptical in form with a thin flowing margin, the body being arched, convex above and concave below, so that it might seem that the whole body could be employed as a sort of sucker to maintain its hold upon the cornea. Indeed, it seems that this actually takes place although the worm is further supplied with very effective organs of attachment. Posteriorly there is a large flattened sucker attached ventrally, and anteriorly there are two smaller suckers on short stalks arising from the margin of the body, one on each side of the mouth sucker. This mouth sucker lies a short distance behind the anterior margin of the body and is directed ventrally. The genital pore lies on the ventral surface at one side of the mouth sucker a little forward of its center and between it and the stalk of one of the anterior suckers. There are two large testes in the middle of the body and a median ovary. The intestinal coeca ramify into all the marginal part of the body and between them lie the lobules of the vitellarium. So much is made out easily by a survey of the whole worm when

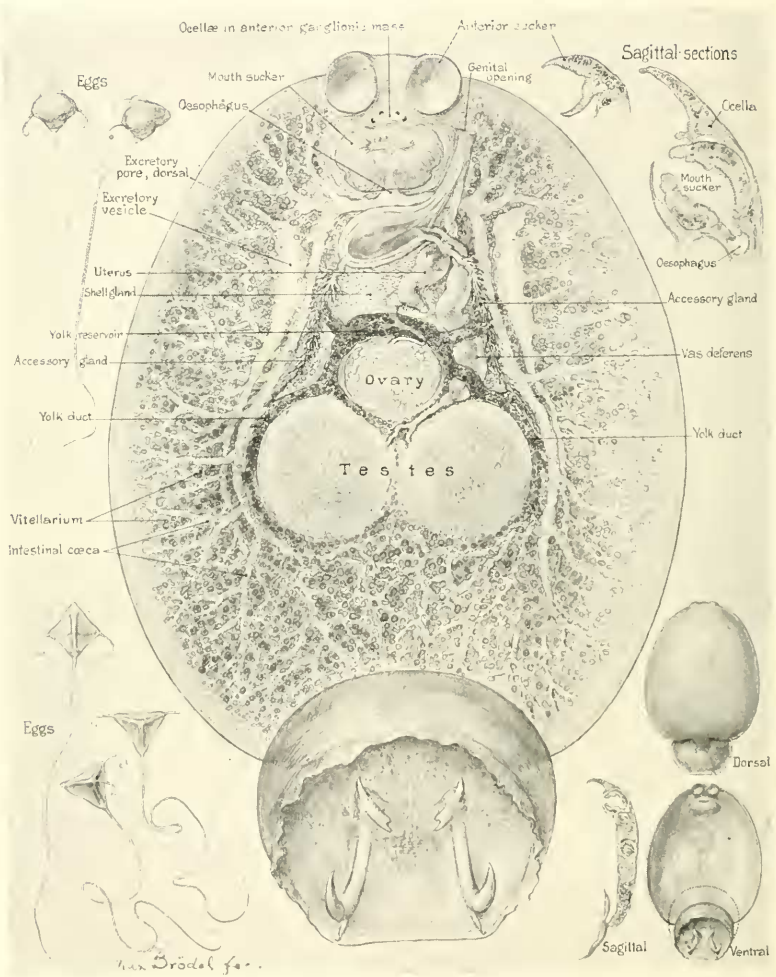


Fig. 154. *EPIHELLELLA MELLENI* SP. NOV.

All the anatomical details are indicated by the legends on the drawing. The small figures are intended to show: the structure of the anterior suckers and of the mouth sucker: a longitudinal section of the whole body in the median line and finally the concavo-convex form of the body. In one of the last the dorsal excretory pores are shown in exaggerated form.



cleared and mounted, but the exact relations of the internal organs were studied in detail in several complete series of sections, cross, horizontal, and sagittal.

The skin is thin, smooth and unarmed. The anterior suckers which project on short stalk-like prolongations of the marginal body wall are rather funnel-shaped with radiating muscle fibres. Little can be seen of any circular fibres and these suckers seem not very powerful. The portion of the body margin between them is marked off by a slight indentation from that on each side, so that this anterior marginal tissue with the two suckers seems to form a forward projection.

The large posterior sucker is round, shallow and flat and is connected in its centre with the middle of the posterior and ventral part of the body—a great bundle of muscle fibres radiates into the body from the centre of the sucker. Its margins are very thin and can apparently complete the air-tight closure of the sucker on the surface adhered to. In sagittal section one sees cross-sections of arcuate fibres directly under the inside and outside surfaces of the sucker while the bulk of its wall is made up of fibres which stretch from one surface to the other. There are scattered among the muscle fibres a few very large nucleated cells which have a granular protoplasm and are very conspicuous against the pale muscle fibres. There are also ramifying excretory channels more distinctly visible here than anywhere else. The lining of the sucker is quite smooth and there are no papillae. Great chitinous hooks are rooted in the muscular substance near the middle and project into the cavity of the sucker. The form of these as well as that of the spines and hooklets can be seen in the drawing. Two ridges arise about the middle of the sucker and from these there project forward and obliquely outward two short spines which are not recurved—their roots are bifurcated or notched.

The large hooks take root at almost the same places and run nearly straight back—covered with the musculature of the sucker and its lining until nearly the edge of the sucker when they suddenly emerge and turn forward as sharp hooks. From near the points where they bend and turn, there arise two other very small chitinous structures which run still further back quite to the filmy edge of the sucker and end in extremely fine hooks.

It is seen that the spines as well as the points of both sets of hooks are turned forward, so that they must be designed to resist, when embedded in the tissues of the fish, a forward pull by the anterior suckers and probably also by the sucker action of the whole anterior part of the body.

The mouth sucker is large and strong—its inner lining being thrown up into folds. Interspersed among the muscle fibres are many very large deeply stained cells with granular cell body of indefinite outline. The sucker does not open directly upon the ventral surface of the body but lies in a pouch with thin lips, the cuticle being reflected inward and upward on the sucker itself. Even back of this

there are wide spaces in the loose tissue about the rest of the sucker. Its cavity opens directly into the oesophagus which is very short. There is no muscular pharynx. From the short oesophagus there spring the two main lateral intestinal trunks which, however, are so abundantly provided with branching coeca extending into all the marginal parts of the body that the main trunks become almost indistinguishable as such. It appears that they anastomose across the body behind the testes but since they are scarcely visible, except in sections, and there is such a bewildering profusion of branches, it is difficult to be quite sure of this. However, since v. Linstow, van Beneden, and others find this anastomosis in other forms in which the intestine is simpler, it seems justifiable to believe that the continuity traced in serial sections is really true. The intestinal trunks and branches are everywhere lined by rather low, flattened epithelium which is, however, high enough to distinguish these channels in sections from the adjacent excretory channels.

The excretory system consists of widely ramifying channels uniting in longitudinal main trunks. It is extremely difficult to make out the precise course of these channels in sections and they are scarcely to be seen in the cleared specimens of the whole worm except where they form large vesicles on each side anteriorly in front of the level of the ovary. There appear to be two main trunks running back from these just outside the margins of the testes and two running forward to pass in front of the mouth sucker. Posteriorly, between the two main trunks, two others appear and all four run backward to give off abundant ramifications in the large sucker. I can find no median vesicle in this position such as is described by von Linstow in *Phylline hendorfii*. The two large lateral vesicles in front of the ovary open by narrow channels far toward the margin of the body on the *dorsal* surface where they produce minute projecting masses which represent the orifices of the thick-walled tubes.

The nervous system consists of a large crescentic mass in front of the mouth sucker with another ganglionic mass clasped about the short oesophagus. Four black eyelets, or ocellae, are embedded in the anterior mass, the two larger outer ones lying somewhat posteriorly and directed forward and inward, the two anterior ones lying between these and directed backward and outward. They consist of cup-shaped masses of black pigment in the concavity of which is a refractive globule but as they lie embedded in the ganglionic mass far below the skin they must be able at most to perceive differences in intensity of light. They, as well as the general distribution of the nerve trunks, have been minutely described by von Linstow and appear to correspond in this form.

The male genital apparatus is of especial interest in that its structure seems different in some respects from what has been described in other members of the genus. There are two rather large rounded testes lying side by side at about the middle of the body. These give off channels which unite to form a large and rather con-